

ROADS AND STREETS

December, 1959

A GILLETTE PUBLICATION



UNIVERSITY MICROFILMS
EUGENE B. POREN
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ANN ARBOR, MICH.
COMP-LRV-11-50

ow End Result Specs
e Working Out

page 75

THE NEW JACKSON TRAILER COMPACTOR



Push or Pull it...
WITH *ANY PRIME MOVER



TEAMMATE OF THE FAMOUS JACKSON MULTIPLE COMPACTOR which was used exclusively for the compacting of sub-bases on the highly critical A.A.S.H.O. TEST ROAD and most all major highway projects. An excellent means of providing compaction at its quickest and best is offered in the choice of these two machines.

For the host of contractors acquainted with the outstanding performance of the Jackson Multiple Vibratory Compactor, the advent of the new TRAILER COMPACTOR will be great news. For here is a machine basically similar, costing considerably less, that can be PUSHED or PULLED BY *ANY PRIME MOVER CAPABLE OF SLOW (50 f.p.m.) WORKING SPEEDS . . . TOWED TO LOCATION AT ANY ROAD SPEED . . . OPERATED IN EITHER DIRECTION, NO TURNING OR BACKING NECESSARY . . . REMOTELY CONTROLLED BY OPERATOR OF PRIME MOVER. WORKHEAD MAY CONSIST OF 3, 4, 5, or 6 VIBRATORY UNITS, (each developing 6,000 lbs. of force at 4200 RPM) OR TWO WORKHEADS OF 4 UNITS EACH MAY BE EMPLOYED. INDIVIDUAL UNITS MAY BE DETACHED AND OPERATED SEPARATELY. POWER PLANT SUPPLIES BOTH SINGLE AND 3-PHASE 110-150 VOLT, 60-80 CYCLE AC AND HAS MANY USES.

Write, wire or phone for additional information.

JACKSON VIBRATORS, INC. LUDINGTON, MICH., U.S.A.

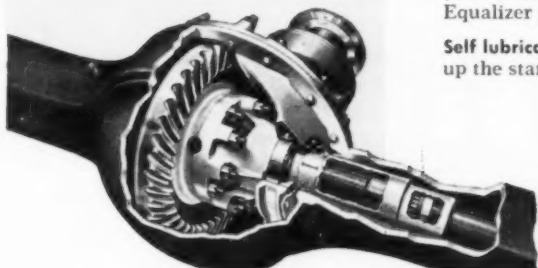
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NEW ROCKWELL TRACTION EQUALIZER...

**puts the
action
where there's
traction!**



**Available
with
Timken-Detroit® Axles
for safer,
surer performance...
on or off
the highway!**



Another Product of...

**ROCKWELL-STANDARD
CORPORATION**



Transmission and Axle Division, Detroit 32, Michigan

Applies driving force to wheels with best traction. The Rockwell Traction Equalizer provides a substantial increase in tractive effort to the wheel with the best road adhesion. It is effective on a vehicle even if one pair of the driving wheels has *no* traction!

Safer, surer operation. A truck equipped with the Rockwell Traction Equalizer is easier to control on curves, slippery pavement and soft ground. The tendency of a vehicle to swerve when one wheel suddenly loses traction is eliminated because wheel spinning is reduced.

Constant actuation. The Rockwell Traction Equalizer doesn't depend on the driver to start it working. It is effective whenever one wheel has the tendency to turn faster than the other.

Tailored for effectiveness. With multi-drive axle vehicles, each axle may be equipped with Traction Equalizer units. No matter where your vehicles operate—on or off the highway—the Rockwell Traction Equalizer gives your vehicles better traction.

Self lubricating. The Rockwell Traction Equalizer automatically picks up the standard axle lubricant and works it through the unit.

Less maintenance. The Rockwell Traction Equalizer normally requires no maintenance between axle overhaul periods. It also cushions heavy impact loads upon tires, shafts and gears.

ROADS AND STREETS

December, 1959

HIGHWAYS • BRIDGES • AIR FIELDS • HEAVY CONSTRUCTION

Industry Affairs, Meeting Reports

Contracting Management, and Job Methods

In This Issue DON'T MISS

The New Contractor-Engineer Relationship
Beginning in this issue an intensive exploration of this basic subject and such related aspects as highway department job quality management, end-result specification, new contractor attitudes. Pages 53, 75, 116, 122.

Equipment Utilization

Engineering, Road Agency Activities

Maintenance, Other Articles, Reports

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Accepted as Controlled Circulation Publication at Milwaukee, Wisconsin. Published monthly. Subscription \$6.00 per year (\$7.00 foreign.) Form 3579 requested to be returned to Gillette Publishing Company 22 W. Maple St., Chicago.

BIDDING A BIG ONE?

Let Goodyear Help
Hold Down Your Costs

FINDING THE WORK FACTORS—Goodyear Big-Tire Specialists will analyze the problems of terrain, loads, climate, roads, schedules, speeds — everything that bears on tire needs and costs.

Then they'll recommend the most efficient and lowest-cost tire to do each job *right*. With a complete line to choose from, they'll get you off to the right start.

PUTTING BIG-TIRE KNOW-HOW TO WORK—From the world's greatest fund of experience in building pneumatic tires, Goodyear Big-Tire Specialists are uniquely qualified to help you. AND provide you with the *proved* best in tread and body designs, in rubber compounds, and *triple-tough* 3-T Nylon Cord — greatest tire saver in 24 years.

SETTING UP BIG-TIRE SERVICE — If desired, Goodyear Big-Tire Specialists will also set up a tire-maintenance program to help save you man-hours, machine-hours and useful tire life. Goodyear Contractor Service will travel with your job — handle all your tire maintenance and repair needs.

With BIG-TIRE PERFORMANCE
Example: HARD ROCK LUG

Typical of Goodyear having the right tire for every need, the Hard Rock Lug (pictured here) is built for heavy loads and no roads to make the going easy. Extra-thick, extra-tough lugs speed the work and shrug off the most brutal use. Made with special cut-resisting rubber compounds, Hard Rock Lug is made to order for the roughest off-highway service.

For all the details on this, other Goodyear special-duty tires, and the Goodyear Contractor Service program, see your Goodyear dealer — or write Goodyear, Truck Tire Dept., Akron 16, Ohio.



TRUCK TIRES by

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

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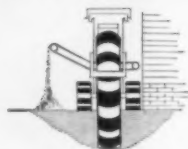
THE MACHINE

for lower-cost digging

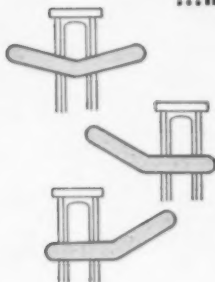


the CLEVELAND J-20 trencher

- less than 5' wide over its crawlers
- digs 13" to 24" wide, down to 5' 6" deep
- puts 24" trench within 20 inches of a parallel wall
- maneuverable full crawler mounting... perfect balance and stability, easy on lawns and sidewalks
- fast, accurate, clean, dependable... nothing digs trench like a Cleveland



Cleveland's unique new V conveyor
...hydraulically shifted...independently driven



- digs past poles, trees, shrubs... places spoil where needed — without interrupting other operations
- lever at operator's seat controls hydraulic shifting and positioning of conveyor
- dual independent hydraulic drive gives operator fingertip control of conveyor belt direction and speed — independent of all other operations
- self-contained hydraulic motor and planetary gear drives in each head pulley eliminate all conveyor chains and sprockets
- provides constant elevating angle for faster, higher spoil discharge
- Maximum clearance under digging wheel rims permits higher heaped loads without clogging
- conveyor design reduces rolling and tumbling

world's finest trencher crawlers

... double flanged sprockets, rollers, wheels... drives on each end of 1 1/2" diameter hardened pins... sealed ball and roller bearings... 1,000 hour lubrication... a tremendously long-lived, easy-rolling track.



hydraulic crumbing shoe

... optional, extra... pivots upward... fingertip control makes crumbing shoe advantages practical in crowded digging conditions.



.....
EVERY OPERATION controlled at operator's seat
.....

The CLEVELAND TRENCHER Co.

20100 ST. CLAIR AVE. • CLEVELAND 17, OHIO



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ROADS AND STREETS

Devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; the construction and maintenance of airports. Represents 67 years of continuous publishing in the highway field; combined with Engineering and Contracting and Good Roads Magazines, established in 1892.

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22 West Maple Street, Chicago 10, Ill.
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EUCLIDS RUSH "Life-Line" TO ORE MINE

Because of its location in a very remote and practically inaccessible area of northern Quebec, a big iron ore mining development awaits completion of a new 200 mile railroad. When operations are in full swing, iron ore from Quebec Cartier's new mine will be transported by rail to Port Cartier, east of Shelter Bay on the St. Lawrence River. From there it will go by ship to steel mills in the United States, Canada and Europe.

Construction of this railroad through rugged country is a big tough job—one that requires dependable, large capacity equipment to keep the rush project on schedule. Pitts-Foley Co., contractors, are using 25 Euclid Rear-Dumps of 22-ton capacity.

Powered by diesel engines of 300 h.p., these "Eucs" haul heavy rock excavation from cuts to fill areas. In spite of steep grades, rough roads and an operating schedule of 20 hours 6 days a week, these heavy duty haulers are maintaining an availability record of 90% or better.

With over 25 years of experience in building specialized earthmoving equipment, Euclid and its world wide dealer service organization offers you bonus benefits that bring a greater return on investment. See your Euclid dealer for technical assistance with any off-highway hauling problem.

EUCLID Division of General Motors, Cleveland 17, Ohio



EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE



Western moved and replaced over 4 million yards of earth in building special \$13,000,000 Jet runways for S.A.C. at Wright-

Patterson A.F.B. Western is pushing for November 1959 completion of runway, ramp and taxi areas. They're using Texaco 100%.

Western uses Texaco Lube Plan

Problem: build a runway two miles long, two feet thick, and tough enough to take the landing shock of planes as heavy as a locomotive—a priority project that must be finished early in 1960. Western Contracting Corporation, Sioux City, Iowa, is moving ahead on this one right now, at the new \$22-million Strategic Air Command Wright-Patterson Air Force Base near Dayton, Ohio. And to help make sure they finish

on schedule, Western relies on a Texaco Simplified Lubrication Plan.

Here's how it works. The Texaco Plan cuts total lube inventory down to six products. That way, each of Western's lube rigs is a complete service station on wheels, able to lubricate every piece of equipment, wherever it is.

The low inventory Texaco Plan cuts chances for misapplication, too. It saves



Western's Texaco Plan enables mobile rig to handle all major lubrication in the field — eliminates wasteful deadheading.

to pave the way for S.A.C.

manhours in storage and handling. It cuts paper work in ordering. And every lubricant in Western's Texaco Plan was chosen to meet the specific requirements of the job.

Cut costs on *your* next job. Get all the facts on the Texaco Simplified Lubrication Plan from your Texaco Lubrication Engineer, or write:

☆ ☆ ☆

Texaco Inc., 135 East 42nd Street, New York 17, New York.

Tune In: Texaco Huntley-Brinkley Report, Mon.-Fri.-NBC-TV

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TEXACO 
Throughout the United States
Canada • Latin America • West Africa

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

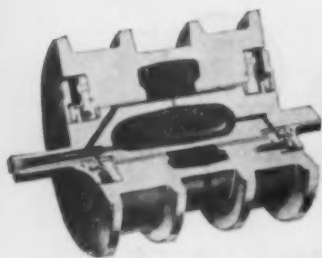
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ROADS AND STREETS, December, 1959

TD-25 power-steering plus

team new 230 diesel hp, new traction..

You "gain ground" on all four steps of the push-loading cycle with the torque-converter TD-25. (1) you slow-down by power-shifting down and using decelerator to get feather-touch contact; (2) power-shift either track up or down to maintain solid pusher contact on curves; (3) get gear-higher kick-outs with on-the-go power-shifting; (4) reposition faster, with higher-than-ordinary reverse!



Dual-protected TD-25 Dura Rollers have precision-fitted, metal-to-metal cartridge-type sealing—to exclude abrasives and retain lubricant. These rollers have pressure relief passages so they can be power-lubricated—without affecting seal life or efficiency. Dura Rollers have king-size lube reservoirs, to make twice-a-year lubing practical!



on-the-go Hi-Lo power-shifting

...to outearn other rigs up to 50%!

You Power-Steer and Power-Shift

the new International TD-25, with 2-finger ease! Exclusive, years-proved Planet Power steering gives you full-time "live-track" power and traction to make full-load turns and eliminate "dead-track drag." Hi-Lo on-the-go power shifting instantly matches power to conditions to prevent losing momentum!

Exclusive Efficiency-Range Control

Exclusive International Hi-Lo power shifting makes the TD-25 the industry's only 4-speed torque-converter crawler, and the only one with load-matching, efficiency-range control. In the synchromesh transmission TD-25, the Hi-Lo planetary system gives eight speeds forward and reverse—with cycle-speeding up-or-down, on-the-go shifting!

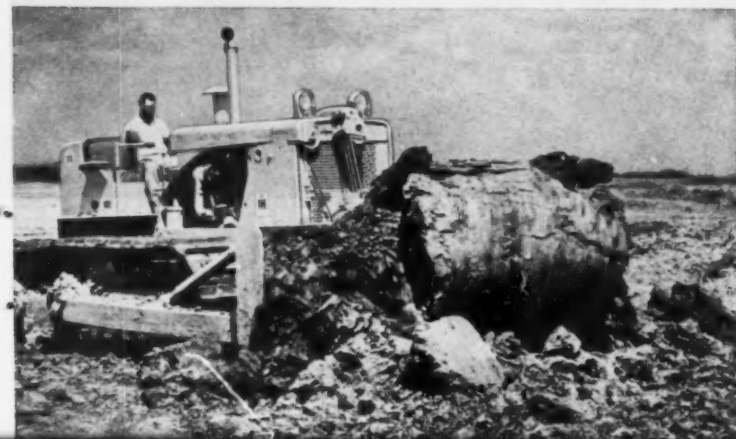
You get big-capacity teamwork of 230 diesel horsepower with the new 7-roller tracks, platformed on super-rugged, double-box-beam frames—and carried on International's new minimum-maintenance Dura Rollers! Over 39 square feet of ground-gripping traction area harness the "25's" great power!

You simply press the direct-start button, to command the "25's" free-breathing diesel horsepower. Dual valving of the "25's" high-torque DT-817 engine provides for peak turbocharging efficiency—to deliver full-rated power from sea level to timberline!

Full performance is at your fingertips, full time. No wonder the TD-25 outearns same-sized clutch-steered crawlers up to 50%—on a wide range of tough jobs!



You don't spill the "pay" part of your load with the TD-25—even when you change speed making the "pass." Hi-Lo on-the-go planetary shifting keeps the blade fully loaded—even when dozing round curves, benching, or side-casting! See how the "25" can help you pocket bigger profits.



SIZE UP TD-25 PLANETARY DRIVE DESIGN

that breaks the load-limiting, time-losing steering and shifting bottlenecks—which plague king-sized, clutch-steered crawlers.

COMPARE NEW TD-25 FULL-LOAD, FULL-TIME ABILITY, to outearn other same-sized rigs—up to 50%! Let your International Construction Equipment Distributor demonstrate!



**International[®]
Construction
Equipment**

International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill.

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers and Bottom-Dump Wagons . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

... for more details circle 310 on enclosed return postal card

Why the thin sidewall of a Beth-Cu-Loy



A 28-ft., 16-gage Beth-Cu-Loy sheet steel culvert demonstrates its ability to flex longitudinally. This illustrates how Beth-Cu-Loy drainage structures can easily be made to conform to curves and changes in grade.

culvert pipe is the secret of its strength

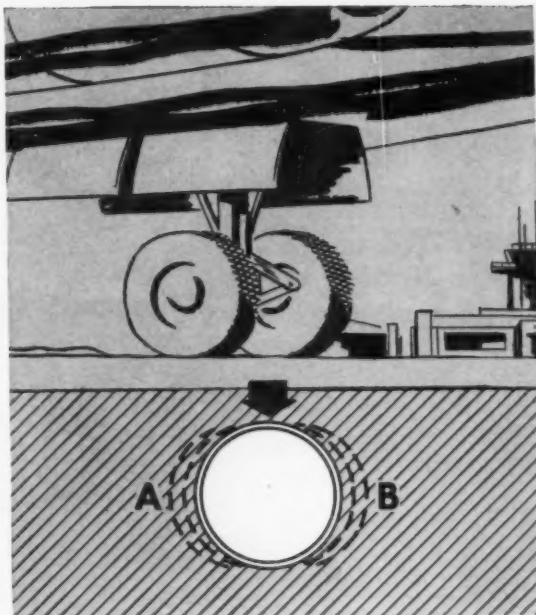
Looking head-on at a drainage structure made from galvanized corrugated Beth-Cu-Loy steel sheets, you might wonder how those thin side-walls can support the load. Yet that very thinness gives Beth-Cu-Loy pipe one of its strongest advantages: flexibility.

Pipe made from Beth-Cu-Loy is flexible both transversely and longitudinally. Because of the latter, easy curves in the line can be made without special fittings or connections. But its transverse flexibility is even more of an advantage.

Makes Use of Surrounding Material

Because of this flexibility, a culvert or drainage pipe made from Beth-Cu-Loy sheets can make use of the surrounding material to support imposed loads. In the drawing above, for example, the load produces controlled deflection in the pipe. As points A and B move into and compact the trench walls, a load begins to develop around these points, spreading the pressures peripherally. Thus flexibility accounts in large part for the ability of corrugated steel pipe to carry the load.

Not so with rigid pipe of the type used for drainage. It cannot flex with the load, thus can-



Exaggerated for clarity, this drawing shows action of Beth-Cu-Loy pipe under load. Pressure against fill, at points A and B, sets up counter-loads which largely offset the forces through the vertical axis.

not transfer a significant portion of the forces to the surrounding material. The bulk of the pressure is exerted through the vertical axis of the pipe.

Bethlehem furnishes galvanized corrugated Beth-Cu-Loy (copper-bearing steel) sheets to fabricators who make culvert pipe and other drainage structures. Beth-Cu-Loy meets the specs of the AASHTO. For full details, just get in touch with the nearest Bethlehem sales office, or write to the address shown here.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL





Keep your equipment working
with CF&I Cutting Edges

The CF&I Image reflects the dependability of *all* CF&I steel products used in the construction industry. On your earthmoving jobs you'll get this dependability when you use CF&I Cutting Edges.

You cut equipment downtime when you use CF&I Cutting Edges, because they are made to stand up under the most rugged conditions. These cutting edges are hot-rolled from special analysis steel selected for toughness and abrasion resistance—steel which has been quality controlled

through every manufacturing stage and fabricated to fit your equipment.

More than 700 CF&I distributors—located coast to coast—stand ready to supply your blades without delay. Grader blades and cutting edges are available in a wide range of curved or flat surfaces, widths and thicknesses for fast, on-the-job installation.

For specific information contact your nearest CF&I sales office or distributor.

FREE! Send for new 32-page catalog, "CF&I Steel Products for the Construction Industry".



CUTTING EDGES

THE COLORADO FUEL AND IRON CORPORATION

In the West: THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso • Ft. Worth • Houston • Kansas City • Lincoln • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City • San Francisco • San Leandro • Seattle • Spokane • Wichita

In the East: WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York • Philadelphia

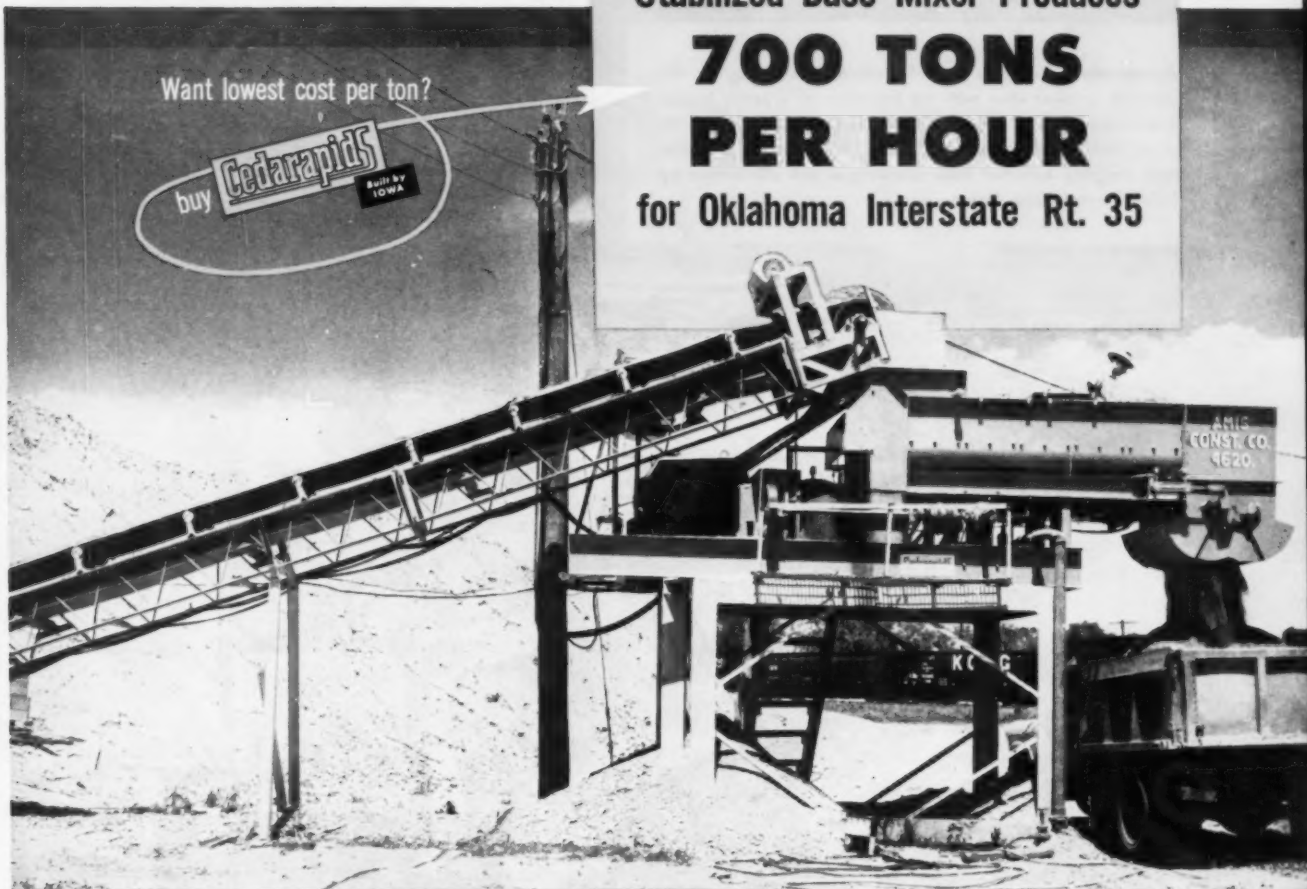
6621

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Want lowest cost per ton?

buy Cedarapids
Built by IOWA

Stabilized Base Mixer Produces
**700 TONS
PER HOUR**
for Oklahoma Interstate Rt. 35



**STABILIZING AGENT ATTACHMENTS
MEET MIX SPECIFICATIONS**



With this versatile unit, you can mix a controlled amount of water with the aggregate, or add calcium chloride, Portland Cement or emulsified asphalt, as specified. Cedarapids feeders provide precise metering of these materials into the mixer.

That's a production record for plant-mixed stabilization material in Oklahoma! Specifications called for a particularly high quality of mix, too. But Amis Construction Company's Cedarapids Twin-Shaft Stabilized Base Mixer blended three sizes of aggregate, mixed it thoroughly with a precisely controlled amount of water, and produced over 700 tons of stabilized aggregate base per hour! In other States, Cedarapids Stabilized Base Mixers are producing as high as 860 tph as a measured minimum!

Production like this is one of the many Cedarapids benefits that assure lowest cost per ton. In the Stabilized Base Mixer, and *every* plant or component in the complete Cedarapids Line, engineering emphasis is placed on high production, the ability to meet strict specifications, and low-cost operation. It adds up to more profit on each ton you produce!

Bulletin SBM-1 gives complete engineering details of the two sizes of Cedarapids Stabilized Base Mixers. Send for your copy today.

IOWA MANUFACTURING COMPANY
Cedar Rapids, Iowa, U. S. A.

Automatic hydraulic self-leveling bucket gives the operator a clear view with the International Wagner loader—unobstructed by cumbersome mechanical linkages. Big, $\frac{3}{4}$ -cu yd bucket is 64 inches wide, has 3,500-lb capacity. Notice how unsightly external hose connections are eliminated by T-340 internal pump design.



New International Drott Four-in-One. Only the new T-340 offers this versatile, high-production unit in the utility crawler field! Left below, showing exclusive clamshell action for "surrounding" materials, or dozing close to green foundations without excessive ground pressure. Right, bottom-dump action provides 9 ft, 6-inch

under-bucket clearance. Also, use the Four-in-One as a regular bucket with $\frac{3}{4}$ cu yd (SAE struck) capacity; a scraper for inch-close grading accuracy; or a bulldozer with adjustable, radius-controlled moldboard for live, earth-rolling action. Parallelogram linkage holds bucket level from ground level to dump height.



already, they're calling it the

"terrific"

T-340

New 45 hp* International Crawler leads its field in **POWER • SPEEDS • STEERING • EQUIPMENT!**

Reports from new T-340 users express amazement at its capacity . . . its push and pull power, compared with what they expected from a 31 drawbar hp rating. But when you measure the T-340 against its field, you see the reasons!

- A quiet, smooth-running, 4-cylinder engine with a proven pedigree for stamina and fuel economy.

- Characteristic IH power-weight ratio, delivering 95 per cent of the T-340's built-in operating weight of 5,600 lb as pull at the drawbar.

- Job-matched speeds. Only the T-340 in its power class offers Torque Amplifier Drive—providing two

*Maximum flywheel hp



CASH BONUS for Early Traders! Right now, your IH Dealer will pay you interest, at the rate of 6% for a specified time, on the value of your trade-in and/or cash payment toward the purchase of new International utility tractors and equipment! Cash bonus paid *immediately*. Protect yourself against possible price increase . . . assure delivery in time for spring jobs—See your IH Dealer NOW!

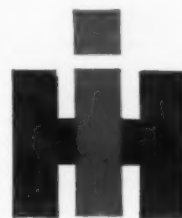
New International hydraulic bullgrader, is raised, lowered, tilted, and angled to right or left—all with fingertip hydraulic control. Blade is 85-inches wide and 25 inches high, plus a 7-inch center spillboard. Can be used in combination with scarifier, winch, and other rear-mounted equipment.

speeds in each of the five regular gears, letting you boost pull power up to 45 per cent, *on-the-go*, without declutching. Or, equip the T-340 with Fast Reverser, giving you *five reverse speeds*, each 22 per cent faster than the corresponding forward gear speed.

- High-capacity, internal hydraulic pump, gives instant-quick, fast-cycle equipment control.

- Exclusive new planetary steering and final drive—quick, easy pivot or "feathered" turns.

Measure the new T-340 by either price or performance . . . you'll quickly see why it's easily today's top value in the utility tractor field. See it soon!



See Your

INTERNATIONAL HARVESTER Dealer

International Harvester Products pay for themselves in use—Farm Tractors and Equipment . . . Trains . . . Industrial Tractors and Equipment . . . Motor Trucks . . . Construction Equipment—General Office, Chicago 1, Illinois.

International Wagner Loader and backhoe can be mounted separately or in combination to form a highly efficient trenching, backfilling, and loading unit. Backhoe can be equipped with regular, mole's paw, bell hole, cemetery, or heavy-duty street repair bucket.



Walker Cut Stone Co., Milford, Kansas, replaced six smaller overworked gasoline haulers with only two 19-ton Model 65 Payhauler trucks! Their "65's" deliver 150 tons of limestone per hour, from quarry to crusher.

How new rock-ribbed 65 Payhauler® pair



speeds "write-off," replacing six smaller rigs!

—for Walker Cut Stone Co., Milford, Kansas

Two new International 19-ton 65 Payhauler trucks—with the new weight-saving corrugated bodies, and the new 250-hp D-817 diesel engine—have replaced six smaller gasoline trucks for Walker Cut Stone Co., Milford, Kansas.

Results are amazing! Only two operators instead of six to pay! Only 40 gallons of low-cost diesel fuel used daily (total) by the two Payhauler rigs—against several times 40 gallons of high-priced gasoline formerly swilled by the carbureted outfits! And only two machines to maintain, instead of six! "Write-off" of the Payhauler investment speeds in "high gear!"

Payhauler features increase capacity!

Even against competitive haulers of similar rated

capacity, the new 65 Payhauler gives you overwhelming advantages!

Of all off-road haulers in its size class, only the 65 Payhauler has the International-developed rock-ribbed corrugated body! This strength-multiplying principle lets the "65" shed 5,000 lbs. of power-wasting weight, and gain a full ton of payload capacity.

Prove the power-to-payload advantages the new rock-ribbed 65 Payhauler delivers! Compare the "65's" cycle-speeding combination of air-assist shifting; 11-second dumping, fast reversing; super-power braking; bonus-leverage, vibration-free power steering! And for 27-ton capacity, note how the 375-hp "95" leads the field. See your International Construction Equipment Distributor for a demonstration!

In only 11 seconds you dump the "65's" 19-ton load—with 3-stage, double-acting, constant-power hoist! Positive up-and-down snubbing guards against impact!



International® Construction Equipment

International Harvester Co., 180 North Michigan Avenue
A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors... Self-Propelled Scrapers and Bottom-Dump Wagons... Crawler and Rubber-Tired Loaders... Off-Highway Haulers... Diesel and Carbureted Engines... Motor Trucks... Farm Tractors and Equipment

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ROADS AND STREETS

Sixty-Six Years of Editorial Leadership

Washington News Letter



By Duane L. Cronk, Director, Highway Information Services

December 10, 1959

The Bureau of Public Roads is drawing a firm line on subcontracting. Faced with an increasing pressure from the states for easements of the 50% limitation of work which can be subcontracted on a federal-aid project, the BPR has decided that the regulation must not be relaxed. For a number of years contractors were required to perform 80% of their own work. The increase in specialty work necessitated a reduction of the limitation to 50% about 10 years ago, but the trend should not go beyond this, the Bureau feels.

"Modifications will be made rarely and only when there is a definite finding that such action is in the public interest," Commissioner Ellis Armstrong has told his regional and division engineers. A few weeks ago, speaking at the Southeastern Association of State Highway Officials, BPR's Engineer Chief G. M. Williams told the assembled state engineers that the Bureau definitely prefers development of a sufficient number of small contracts to invite direct competition, rather than forcing small contractors to work as subcontractors.

* * *

A closed confab of manufacturers and highway interests involved in asphalt paving was called in Washington recently to discuss what was described as a widespread inadequacy of current compaction specifications for new roads. The road-builders were also concerned about the expansion of "end-results" specifications, and further research with pneumatic tire equipment to obtain higher paving densities. The problem: high-pressure truck tires which widely adopted within the last few years, are exerting pavement pressures of 65 psi to 125 psi. Many of the highways being built today are reportedly compacted to only 40 to 60 psi, however. New design standards and a drastic review of construction specifications to avoid surface rutting under these higher pressures may be necessary, some feel.

Manufacturers of pneumatic compactors and tires were called in to determine if existing equipment is capable of producing higher compaction requirements - say 80 psi. They insisted that this would be no problem; existing equipment is capable of exerting from 80-100 psi with standard tires and rims. J. E. Corey of the Firestone Tire and Rubber Company reported the availability of pneumatic compaction tires in five sizes. However, if manufacturers could agree on one common rim size, significant operating economies could be realized on the job.

John Laing, equipment specialist for the Bureau of Public Roads, reported that if highways are not to fail under modern traffic, minimum roller pressures must be boosted to 80-95 psi, at least. Contractors representatives present agreed that the performance of asphaltic paving is affected, and that adequate design criteria and compaction specifications must be developed.

(continued on next page)

BPR officials are also embarrassed because of the great variation of compaction specifications throughout the states. Congressmen, investigating the road program, wonder at the variation between even adjoining states with similar soil conditions and usually feel that the higher - and more costly - specifications constitute "over-design." It is difficult to explain that the opposite may be true. The lack of uniformity also hampers contractors who operate over state lines, and it deeply concerns equipment makers who must design for these multitudinous requirements. One manufacturer told the Bureau that varying compaction equipment requirements of the state department necessitate 22 models. Proper standardization could reduce this number by two-thirds resulting in lower equipment costs.

* * *

H. A. Radzikowski, chief of the Division of Development at the BPR, is pushing for both more uniformity of compaction requirements and the adoption of end-results specifications to permit greater utilization of new machines and encourage contractor innovations. In the meantime, he believes, the industry needs far more data on equipment performance, specifically:

- The effect of basic roller design - tire size, wheel spacing, or overlap, and other machine characteristics which affect performance. Accelerated tests at an equipment proving ground would produce this information.

- Performance data obtained from actual projects under various soil and moisture conditions. Many smaller contractors do not have the large selection of compaction equipment which the big firms have for experiment in determining the most economical unit to use in any one job situation. So performance information should be in terms which can be utilized where comparable job conditions are encountered. Such terms as "a 13-wheel pneumatic roller, or an 11-ton pneumatic roller" are meaningless as far as compactive ability is concerned.

"We believe that the average ground or contact pressure range is the most important capacity criterion in manufacturers' specifications," Mr. Laing told the meeting. "Weight ballasted and unballasted, number and size of tires, tire spacing or overlap data, etc., are important to a lesser extent. It will also be necessary to retain such meaningless capacity ratings as 'pounds per inch of tire width' during a transition period, since a contractor must know whether or not his roller meets some of the unrealistic construction specifications which remain in use."

* * *

A new study of concrete mixing times reveals that the 50 state highway departments specify about 20 different mixing periods for dual drum machines. Morgan Kilpatrick of the BPR feels that the variations arise because there is no accepted definition of when a mixing cycle begins and ends, a refusal to allow transfer time (5 to 9 seconds) as part of the mixing time, and requirements for excessive time in the first drum.

BPR engineers believe that a 60-second mixing time, including transfer time, is adequate for dual drum pavers in good mechanical condition and that the same criteria should apply to the new triple-drum machine.

The significance of permitting transfer time as part of the 60-second cycle is economic. Mr. Kilpatrick's studies reveal that the cost of unnecessary mixing time in concrete paving operations run from 2¢ to 3¢ per second per cubic yard. On this basis, the addition of 18 seconds of unnecessary mixing time above 60 seconds on the triple-drum machine, for example, could add 25¢ per cubic yard to the cost of the Interstate highways, or about \$2,000 per mile.

YARDS AHEAD

WHEN PRODUCTION COUNTS



CURTISS-WRIGHT MODEL

215

CW-215 SELF-PROPELLED SCRAPER

Capacities: 15 cu. yds. struck, 21 cu. yds. heaped, 42,000 pound rated load

SALES • SERVICE • PARTS

at your

CURTISS-WRIGHT DISTRIBUTOR

HEAPS IN A HURRY — cuts minutes from the miles . . . That's why the Curtiss-Wright CW-215 moves the most dirt — makes the most profit for contractors like R. C. Wetherall, shown here working on a West Virginia road job . . . This hustling pair of 215s consistently pack in heaping loads of clay, shale and rock — and really keep the pusher operator hopping to keep up with their fast cycles.

UNUSUAL MACHINE? Not really! You'll find the same high performance in the entire CW line — from the 7 cu. yd. CW-27 to the big CW-226, largest two axle scraper on the market. Check any model against your job requirements . . . put "Yards Ahead" performance to work for you.

AD NO. 52-45



SOUTH BEND DIV. CURTISS-WRIGHT CORPORATION, SOUTH BEND, INDIANA

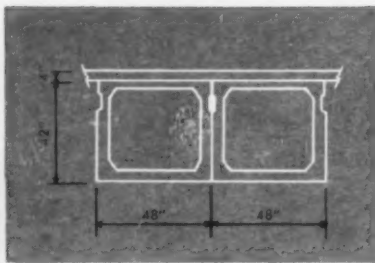
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SOUTH BEND, INDIANA

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for left

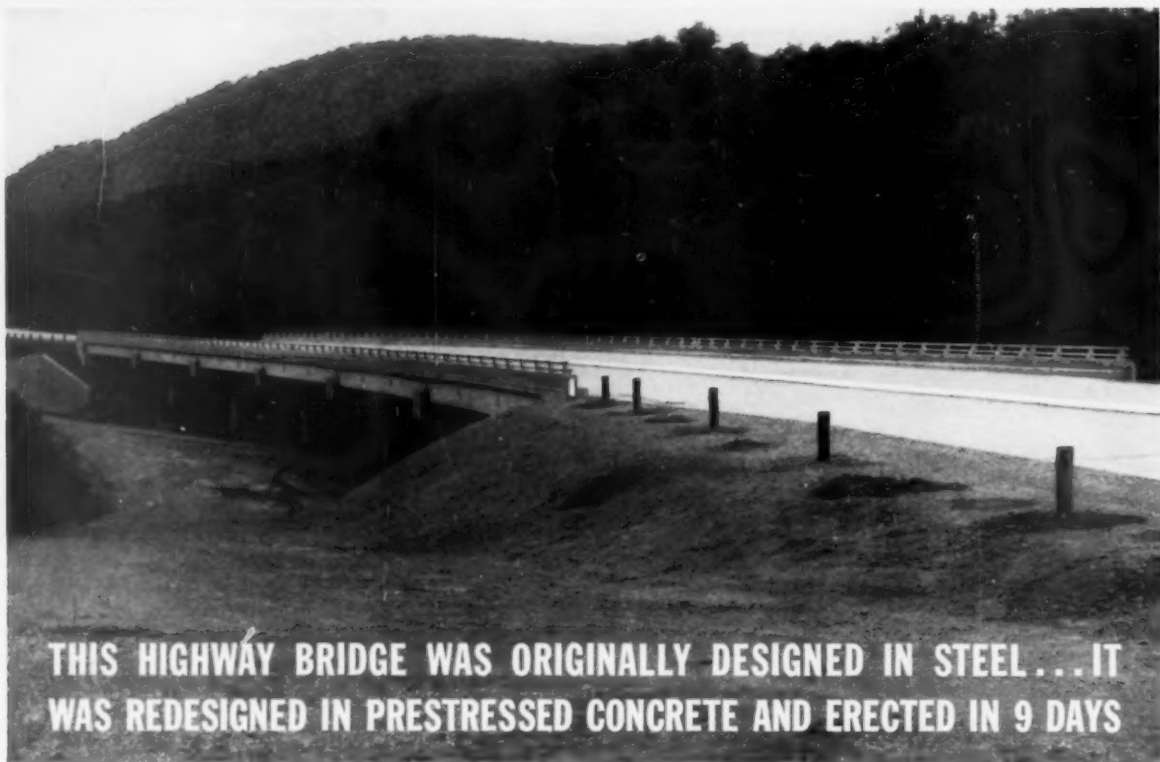
Detail of bridge showing cut outs in beams at pier cap, giving maximum clearance. Structure's 96 box beams were furnished through American Marietta Co. by Pennsylvania Prestress Co. and Schuykill Products Company. Other five bridges fabricated by American Marietta Company.

left

Partial cross section of a deck-type bridge, showing two precast rectangular sections and poured-in-place concrete topping.

below

Overall view of Structure #4, one of 6 highway bridges designed in Prestressed Concrete by American Marietta Company. Contractor: C. J. Langenfelder, Baltimore, Md. Stress-relieved strand by Roebling.



THIS HIGHWAY BRIDGE WAS ORIGINALLY DESIGNED IN STEEL... IT WAS REDESIGNED IN PRESTRESSED CONCRETE AND ERECTED IN 9 DAYS

This bridge is Structure #4, Duncannon By-Pass, Perry-Dauphin Counties, Pennsylvania. Because of prestressed concrete's inherent economy and the possibility of wintertime erection, it was redesigned from steel to prestressed, an alternate permitted by the Pennsylvania Department of Highways.

It is particularly interesting since underclearance conditions required special cut outs at the ends of all the beams, making it, perhaps, the only bridge of its exact type in the country. It was designed by the Concrete Products Division, American Marietta Company, Chicago, Illinois, and is a curved structure with six 80' spans utilizing 42" x 48" box beams with a composite slab. It is on a spiral runout of a horizontal curve with the post-tensioned piers being radial, thus making the out-

side fascia beams longer than the inside fascia beams. The post-tensioned pier cap girders (precast at job site), plus the 96 pretensioned box beams for the deck were erected in 9 working days.

Maximum headroom was obtained by using 48" wide x 50" deep post-tensioned pier cap girders and by cutting out the beams at the point where they framed into the girders (see detail above).

Roebling has been a strong and ardent advocate of the prestressed concrete method since its introduction in the United States. Our knowledge and experience covers all aspects and we will be happy to share it with you. Your need may be as simple as the names of prestressed fabricators in your area or, perhaps, your question may have to do with beam designing

procedure or a request for data on typical prestressed members. Whatever it may be—and for whatever structure: schools, garages, transportation terminals, piers, bridges or office buildings (to name a few)—you have only to address your questions to Construction Materials, John A. Roebling's Sons Division, Trenton 2, New Jersey.

Now available on request—Roebling Data Sheet PC 946 "Design Procedure for a Simple-Span Prestressed Concrete Beam." Based on ACI-ASCE Committee 323 Report "Tentative Recommendations for Prestressed Concrete," this procedure is an excellent guide for engineers in the design of prestressed concrete members.

ROEBLING

Branch Offices in Principal Cities
John A. Roebling's Sons Division
The Colorado Fuel and Iron Corporation



MEETINGS

AGC NEW YORK STATE CHAPTER—Annual Meeting, Waldorf Astoria Hotel, New York, N.Y.; December 15-16.

ASSOCIATED CONTRACTORS OF NEW MEXICO—Annual Meeting, La Fonda Hotel, Santa Fe, N. Mex.; December 17.

HIGHWAY RESEARCH BOARD—39th Annual Meeting, Sheraton-Park Hotel, Washington, D. C.; January 11-15.

AMERICAN ROAD BUILDERS ASSOCIATION—Annual Convention, Netherland Hilton Hotel, Cincinnati, Ohio; January 18-21.

NATIONAL LIMESTONE INSTITUTE—15th Annual Meeting, Statler-Hilton Hotel, Washington, D. C.; January 19-21.

ASSOCIATED EQUIPMENT DISTRIBUTORS—Annual Meeting, Conrad Hilton Hotel, Chicago, Ill.; January 24-28.

NEW YORK STATE COUNTY HIGHWAY SUPERINTENDENTS' ASSOCIATION—Winter Meeting, DeWitt Clinton Hotel, Albany, N.Y.; January 27-29.

NATIONAL BITUMINOUS CONCRETE ASSOCIATION—5th Annual Convention, Sheraton-Cadillac Hotel, Detroit, Michigan; Feb. 1-4.

NATIONAL READY MIXED CONCRETE ASSOCIATION—Annual Convention, Conrad Hilton Hotel, Chicago, Ill.; February 15-19.

NATIONAL SAND & GRAVEL ASSOCIATION—Convention and Exposition, Conrad Hilton Hotel and Coliseum, Chicago, Ill.; February 15-19.

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS—Winter Meeting, Broadview Hotel, Wichita, Kansas; February 18-20.

NATIONAL CRUSHED STONE ASSOCIATION—Annual Convention and Exposition, Conrad Hilton Hotel, Chicago, Ill.; February 22-24.

AMERICAN CONCRETE INSTITUTE—56th Annual Meeting, Commodore Hotel, New York City; March 14-17.

Parts Suppliers Meet

The Associated Independent Rebuilders and Parts Suppliers held their annual meeting at Roanoke, Virginia. The meeting sessions included an equipment and idea clinic and a workshop built in a nearby garage and parking lot.

Link-Belt Speeder self-contained Diesel

PILE HAMMERS with Tri-Power cycling

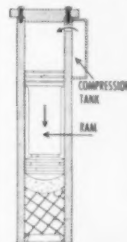
Keep the pile in motion longer!

Three-stage power *plus* shorter stroke, faster ram return, more blows per minute put Link-Belt pile hammers *far ahead* of steam, air, drop or other makes of diesel hammers. No compressors, no boilers, no damage to pile heads. Starts easier, uses less fuel. Hammers are offered up to 7,500, 18,000 and 30,000 ft.-lbs. per blow.

1

Preload anvil and pile... readies pile for driving

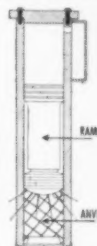
The ram is lifted by the crane hoist line and dropped. Air is trapped and compressed between the dropping ram and anvil at bottom of cylinder, preloading pile.



2

Impact of ram on anvil puts pile in motion

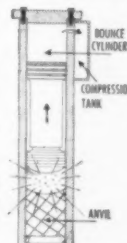
... by breaking static friction between earth and pile. Crane operator controls all operations. No separate throttle operator is needed, but ground level control system can be used.



3

Explosive force keeps the pile in motion

Two-way expansion of combustion gases keeps pile moving—also drives ram upward to complete the cycle. Enclosed cylinder head keeps out dirt, shortens stroke, insures more blows per minute.



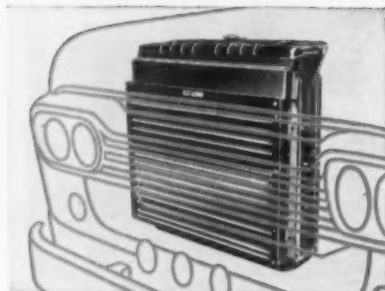
See your Link-Belt Speeder distributor for one-stop sales and service on both diesel pile hammers and cranes. Link-Belt Speeder Corporation, Cedar Rapids, Iowa.
105-59N

LINK-BELT SPEEDER



It's time to compare... with a Link-Belt Speeder
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NOW! Certified Durability



CLOSER TEMPERATURE CONTROL obtained with automatic radiator shutters means longer engine life, more efficient operation. Temperature variation between 167° and 187° with shutters as compared to 102° to 181° without shutters was reported and certified in loaded vehicle road tests.



LONGER WIRING HARNESS LIFE is the direct result of Ford's greatly improved electrical wiring system for 1960. Ford's '60 wiring harness and the 1959 wiring harness were subjected to shaker table tests plus constant exposure to oil and water vapors, and temperatures of 200°. Certified test results show a threefold increase in 1960 wiring harness life.



INCREASED FUEL PUMP RELIABILITY is an added benefit from Ford's submerged-type electric fuel pump. Certified results of dynamometer tests showed no vapor lock with Ford's electric pumps at temperatures up to 200°, whereas incipient vapor lock with mechanical fuel pump resulted in a power loss of 9% under same conditions.

It's a fact! Numerous reports from high-mileage operators of Super Duty Trucks attest to Ford's outstanding durability. Studies by an independent research firm provide certified proof that these models are even more durable for 1960.

Ford Super Duty Trucks have earned a reputation for exceptional performance and durability since their introduction two years ago. Shop service records of many leading fleets show Super Duty tractors with mileage readings between 150,000 and 250,000 and no repairs other than normal maintenance. Similar testimony to the dependability of these Big V's by other satisfied users is being added each month. Is it any wonder that '59 sales of these units were more than double those of 1958?

And for 1960, the Ford Super Duties offer additional refinements. Bigger optional axles and increased GVW's to permit greater payloads and more profitable operation. Automatic radiator shutters to keep the engine temperatures within the most efficient operating range, improved submerged-type electric fuel pumps to prevent vapor lock, and redesigned wiring for more reliable operation are typical of the improvements to be found in these units.

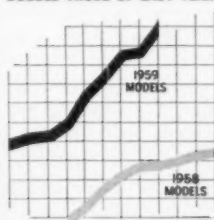
The changes offered for 1960 were tested and evaluated by a leading research organization. Certified results of the studies by this impartial firm (name available on request) provide proof that Ford's Super Duty Trucks are even more dependable.

- **Certified Durability through closer temperature control!** Independent research engineers certify that Ford's thermostatically controlled radiator shutters kept water temperature between 167° and 187° in severe mountain grade operation. The test truck with shutters blocked open under same operating conditions had a temperature range from 102° to 181°. The temperature variation of only 20° with shutters means less expansion and contraction in block and heads. Higher, more constant temperatures permit oil to circulate more freely, reducing internal friction. All these factors contribute to longer engine life.
- **Certified Reliability with longer-lived electrical system!** Thicker insulation on wires resists deterioration by heat, oil and gasoline. Asphalt-impregnated loom and plastic-coated mounting clips protect against abrasion. Certified results prove that the 1960 wiring harness has three times longer life.
- **Certified Reliability with Ford's submerged-type electric fuel pump!** Dynamometer tests of engines with submerged-type electric fuel pump and conventional mechanical type showed that vapor lock was non-existent with Ford's electric pumps at temperatures up to 200°, whereas incipient vapor lock with mechanical pump resulted in a power loss of 9% at an underhood temperature of 200°.

Endurance tests were run on alternators, two-speed axle speedometer adapters and other related components with similar results. Get all the facts at your Ford Dealer's now!

in Ford Super Duties!

1959 FORD SUPER DUTY
TRUCK SALES MORE THAN
DOUBLE THOSE OF LAST YEAR



"Our first Ford C-1000 tractor has logged 190,000 trouble-free miles since March of '58,"

says Robey W. Estes, Vice President and General Manager of Estes Express Lines, Richmond, Va. "We haven't had a single road failure and we only bring it into the shop for regular preventive maintenance work once a month.

"We use the 477 engine and find oil consumption is exceedingly low . . . only one or two quarts added between 3000-mile oil changes.

Engine compression at 190,000 miles is still high and fairly equal and our drivers say that power and pep are at about the same level as when the truck had been run only 60,000 miles.

"We are grossing between 52 and 56,800 pounds with our Ford Tilts. They are giving about the same gas economy and better oil mileage than other makes in our fleet. We bought our fourth Ford C-1000 tractor last month and hope to add more soon."

FORD TRUCKS COST LESS

LESS TO OWN . . . LESS TO RUN . . . BUILT TO LAST LONGER, TOO!

. . . for more details circle 303 on enclosed return postal card
ROADS AND STREETS, December, 1959

People

Moles Awards to Denny, Drake

William Denny of Garden City and George Morgan Drake of Minneapolis were named as the 1960 recipients of the awards given annually by The Moles for "outstanding achievement in construction."

The announcement was made by Moles president Mansell L. Mac-

Lean who heads this association of leading figures in the tunneling, dam-building and heavy construction industry. Formal presentation will be at the annual Moles' Awards dinner, Waldorf Astoria Hotel, New York, January 27.

Denny and Drake make up the 20th pair of honorees in a series numbering such winners as Former President Herbert Hoover, Robert

Moses, Admiral Ben Moreell, Peter Kiewit, Harvey Slocum and Lou Perini. The award is considered the highest recognition that can be accorded for service to the American construction industry. It is made annually to one society member and one non-member (Denny is member winner).

Mr. Denny is executive vice-president of Merritt-Chapman & Scott Corporation in charge of its construction department which currently has Glen Canyon Dam, Priest Rapids Dam and the main generating plant of New York's Niagara Power Project in its huge portfolio.

Mr. Drake is president and general manager of Johnson, Drake & Pipe, Inc., Minneapolis, with its international staff of some 300 administrators, supervisors and engineers and 40,000 peak employees. This firm's work includes highway building in many states, and heavy projects in many countries.

JOHN C. HAYES, legal counsel for the Associated General Contractors of America, died recently at age 71. In addition to the services which his firm, Hayes & Hayes, rendered to the construction industry as AGC counsel for more than a quarter of a century, Mr. Hayes achieved wide recognition in the fields of administrative law, tax law and government contracts.

E. J. THOMAS, chairman of the board, Goodyear Tire & Rubber Company, is elected vice-chairman of the Automotive Safety Foundation. He succeeds L. R. Jackson of Firestone Tire & Rubber Company.

Stanley Hope, Foundation chairman, also announced three new members for its operating Committee: H. E. Humphreys, Jr., board chairman, United States Rubber Company; J. Ed. Warren, president, Cities Service Company, and Herbert Willetts, president, Mobil Oil Company.

A. C. LEONARD, chief of secondary roads, Bureau of Public Roads in Washington and former county engineer of Rochester, Minnesota, died recently at age 58.

HI-WAY Model E Spreader

FOR ICE
CONTROL



Fast, one-man operation, fewer reloads, better traction, 4 to 40 ft. spreads of sand, salt or cinders!

3 Different Models Available:
Truck mounted with PTO drive — easy to operate, economical to use. Truck mounted, engine powered (hydraulic drive available) — for more accurate, positive spreads. Dump body mounted, engine powered — use one of these lower cost rigs with several trucks, on or off truck in minutes. Capacities up to 8.8 cu. yds. mean fewer trips to the stockpile. Wide conveyor and steep 45° sides prevent bridging.

Other Model E Features

- 24" heavy duty conveyor
- 20" spinner with replaceable fins
- Removable inverted "V" over conveyor on 13 and 15' models
- Complete control from cab
- Accessory equipment for every need

Write for the latest literature and complete specifications.

HIGHWAY EQUIPMENT COMPANY

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**30D
SERIES**

**42D
SERIES**

**Two New Additions
to the Expanding Line of**



More than
Two Million Eaton Axles
in Trucks Today

**EATON
TANDEM AXLES**

**Provide Famous Eaton Design
in a Wider Range of Sizes**

Two new Eaton Tandem Axle models now extend the line of famous Eaton Tandems into a much wider range of vehicle capacities—from 38,000 lbs. GVW to 55,000 lbs. GVW.

Eaton Tandem Axles offer advantages not available in other tandems. Included are important savings in weight and over-all length with no sacrifice of stamina. These operation-proven axles may be selected

from Single Speed, 2-Speed, and Double Reduction types. The 2-Speed and Planetary Double Reduction models provide the many advantages of Eaton's exclusive planetary gearing design—substantiated by billions of miles of economical, trouble-free service.

Ask your truck dealer to explain the 10 big benefits you get with Eaton Tandem Axles—and how they can make your hauling operations more profitable.

EATON

—AXLE DIVISION—
MANUFACTURING COMPANY
CLEVELAND, OHIO, U.S.A.

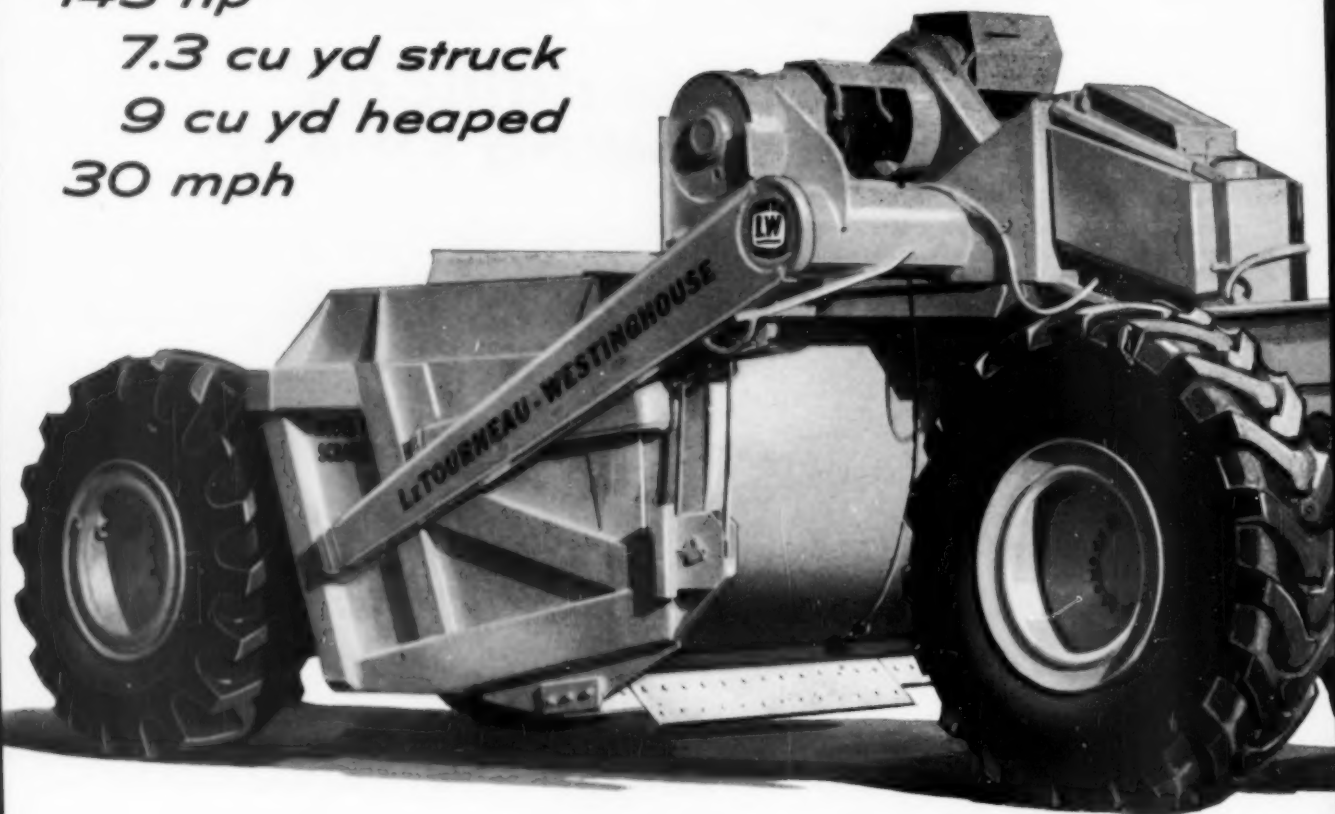
NOW *another D 'Pull' profit-builder*

143 hp

7.3 cu yd struck

9 cu yd heaped

30 mph



Here's WHY D 'Pull **is a money-maker on any-sized job**

D Tournapull
ALONE in its size-range offers you:

PERMIT-FREE ROADABILITY: meets 8-foot width and weight limits, for quick, low-cost moves. Travels over city streets, curbs, anywhere, at up to 30 mph.

POWER-TRANSFER DIFFERENTIAL: automatically keeps greater power on drive wheel in best footing. Keeps production high on terrain that stops other units.

ELECTRIC CONTROLS: fastest-responding, simplest-operating, easiest-maintained control system built. Your operator works faster, more productively.

And D 'Pull **LEADS** its size-field
these important ways:

BEST POWER-WEIGHT RATIO: each of its 143 "horses" has to power only 299 lb. Move payweight, not dead-weight. Best on grades, fastest accelerating.

SHORTEST TURN-RADIUS: U-turns in only 24'3" for quick maneuverability in tight quarters. With flat bottom, "D" is an excellent finisher, too.

BIGGEST BRAKES: 2,800 square-inches of sure-stop surface, up to 4 times more than other scrapers. Your operator uses higher speeds more confidently.

Two 'bonus' advantages: D Tournapull offers you the lowest list price of any well-known scraper in its class. And around the world, it brings its owners the highest trade-in value. Compare 'em!

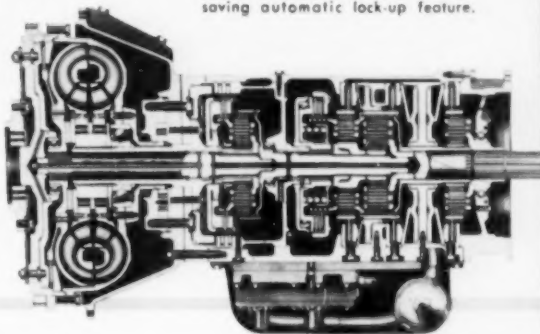
...your choice of transmissions

Add one more to the impressive list of production-boosting, cost-cutting advantages you get with D Tournapull®. Starting right now, you can order new "D's" with either of two of the most rugged and efficient transmissions ever developed. They are:

Power-shift with torque converter:

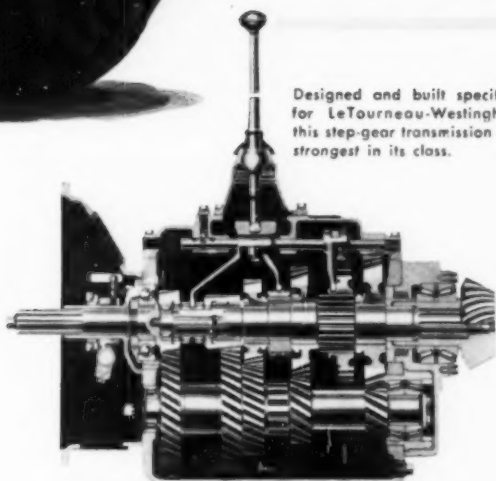
If you often work in loose or soft materials, and your machines are usually subject to rapidly changing loads, you will want your "D" equipped with the Allison Torqmatic CLT 3340 transmission, now available. It automatically adjusts speed and torque to your load, keeps your D 'Pull working at fastest practical speed. Cushions engine and drive-train from shock-loads for smoother operation, longer machine life. Infinite speeds through four ranges, to 30 mph; two reverse to 6.9.

Allison transmission includes power-saving automatic lock-up feature.



2 Step-gear "stick-shift":

If most of your work is on jobs where haul-roads are well-maintained, and you work in generally normal footing, your D 'Pull equipped with the special Fuller 5G-720 step-gear transmission will give you extra operating economy. You get automatic filter action, full-pressure lubrication, and clutch-saving inertia brake. Gear teeth are crown-shaved, and the case is super-heavy. Five forward speeds to 26.1 mph, reverse 2.8.



Designed and built specifically for LeTourneau-Westinghouse, this step-gear transmission is the strongest in its class.

Get this free "D" booklet now:

Ask your LW Distributor (or write the factory) for this brand-new booklet explaining all about the D Tournapull. It shows you how to *make more money on any-size job* with this rugged "go anywhere" machine. It also explains every major mechanical component of the "D", including the two new transmissions. You'll want it for your equipment-data files.



*Trademark DP 2252-DC-2



LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

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New Publications

Prestressed Concrete Beam Design Methods

"Design Procedure for a Simple-Span Prestressed Concrete Beam," is the title of a publication prepared by John A. Roebeling's Sons Division, Colorado Fuel and Iron Corporation, Trenton 2, New Jersey.

Marked Engineering Data Sheet PC-946, it replaces an earlier sheet of this nature issued by Roebeling.

The design procedure presented is intended to help the engineer to make his own design analysis, in accord with the Tentative Recommendations for Prestressed Concrete, as issued in January, 1958, by ACI-ASCE Committee 323.

The ACI-ASCE Committee recommendations constitute a complete recommended practice, prepared by recognized authority and suggested as the basis for all design of prestressed concrete where applicable. The Roebeling data sheet hence is in the nature of a supplementary aid, prepared for use in developing detailed analyses and designs for bridge deck beams and other simple-span prestressed members.

Sheet PC-946 is available free on request to the Roebeling organization, at the above address.

STUDY OF DEEP SOIL STABILIZATION BY VERTICAL SAND DRAINS. Moran, Proctor, Mueser & Rutledge for Bureau of Yards and Docks, U.S. Navy. June 1958. 468 pages. (Order PB 151692 from OTS, U.S. Department of Commerce, Washington 25, D.C. \$6.00.)

This study was undertaken to develop a factual correlations between actual and predicted performance of sand drains under the loads of fill placed on unstable foundation soils. Summaries of the detailed investigation of 26 sand drain installations are included in the report. Also included is a section on design methods and procedures and guide specifications in discussion form which can be used in the preparation of job specifications.

The importance of evaluating the effect of gas in voids of the soil on the time rate of consolidation became apparent as this study progressed, and a method of analysis was developed which is expected to be useful in other problems involving consolidation of partially saturated soils.

The book includes sections on "Theory of Consolidation by Sand Drains," "Soil Properties Affecting Design of Sand Drain Installations," "Analyses of Existing Vertical Sand Drain Installations," "Conclusions and Recommendations," and "Recommended Uses and Design Procedures."

CHARTING STEEL'S PROGRESS. A graphic facts book on the iron and steel industry, 1959 edition, American Iron and Steel Institute, 150 E. 42nd St., New York 17, N. Y. Valuable data for steel users, free on request.

INTER-GOVERNMENTAL RELATIONS IN STATE HIGHWAY LEGISLATION: An analysis. Special Board, 2101 Constitution, Washington, D. C. Price :\$3.20. A 100-page review by the H. R. B. Committee on Highway Laws.

Clay Soil Problems

A practical discussion of clay terrain construction problems is included in Colorado School of Mines Quarterly (Vol. 54, No. 4). Price \$2; obtainable from the Department of Publications, the Colorado School of Mines, Golden, Colo.

The book is a compilation of papers on the theoretical and practical treatment of expansive clays—an outgrowth of the First Annual Soil Mechanics Conference, held at the school in April, 1959. The papers discuss problems of building on the expansive soils of mid and south U.S.

The conference's aim was to further develop knowledge of shrinking and expanding soils in a form that can be readily utilized by engineers and architects. It also has a direct connection to building contractors and real estate planners.

Included are papers by Means

(Oklahoma State U), Lambe (MIT), McDowell (Texas Highway Dept.), Dawson (University of Texas) and Holtz (U.S. Bureau of Reclamation).

HIGHWAY PAVEMENT DESIGN IN FROST AREAS, A SYMPOSIUM: PART I—BASIC CONSIDERATIONS. Bulletin 225, Highway Research Board, 2101 Constitution, Washington, D. C. Price: \$2.60. This 131-page bulletin is the first of a series published out of recent HRB Meetings on the general subject noted.

Highway Research Board Annual Proceedings

A selection of the 38th Annual Meeting papers of the Highway Research Board have been published as the Board's 1959 proceedings. 6 1/2 x 9 1/2 in., cloth-bound cover.

Contains 34 papers and discussions, minutes, Committee names, and other data; also a glossary of the Board's research abstracts, bulletins, special publications, and other 1959 issues.

Available at \$10.00. Address Highway Research Board, 2101 Constitution Avenue, Washington, D.C.

HOW EXPRESSWAYS HELP MICHIGAN AND YOU. An inexpensive but attractively prepared brochure for popular distribution, by the Michigan Good Roads Federation, 614 Michigan National Tower, Lansing, Michigan. Based on safety and other studies by Dr. Frank Suggitt, Michigan State University.

HANDBOOK OF HEAVY CONSTRUCTION, Frank W. Stubbs, editor-in-chief. 1040 pages, 6 x 9, 600 illus. \$18.50. 10-day free examination. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N.Y.

BITUMINOUS PATCHING MIXTURES AND SEAL COSTS. Bulletin 215, Highway Research Board, 2101 Constitution, Washington, D.C. Price \$.80. Contains papers presented at the Board's 37th annual meeting.



**The faster you get to a job...
the quicker you complete it...
the more return you get
on your tractor investment**

In less than 4 minutes, a fast LeTourneau-Westinghouse Tournatractor® drives a mile to your next job. This mobile 17-mph LW tractor travels anywhere under its own power — via highway, or cross-country.

When moving to a new project, Tournatractor saves you time and expense of moving in extra men, extra transport equipment... loading, blocking, and unloading.

This 218-hp rubber-tired tractor not only saves time traveling job-to-job... it saves time *on the job*. With its higher *working* speeds, both forward and reverse, torque-converter equipped Tournatractor completes most assignments *faster* than "track" units of comparable power. And the *range* of work Tournatractor will handle is wide. It will do **ALL** your normal dozing and "push-pull" jobs, with all the "muscle" you need.

LW Tournatractor has anti-friction bearings throughout... with sealed-in lubrication to protect against weather, dust, and wear. What's more, this rubber-tired tractor has far fewer moving parts and far fewer exposed parts than crawlers, so all phases of maintenance — from inspection to lubrication — are greatly simplified, to save you money.

**Figure for yourself
what these advantages
mean to you:**

- 1. Greater speed on the job:** completes assignments faster.
- 2. Roadability:** cuts moving costs, and non-pay hours of moving time.
- 3. Fast one-man moves:** lets Tournatractor work more productive-hours per shift... lets you handle more work at lower cost.

LW Tournatractor has proved itself in every climate and in all kinds of working conditions. It can save **YOU** time and money. Get full details on this versatile, high-speed tractor-on-rubber.

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New Publications

SOIL MECHANICS AND EARTH STRUCTURES. Bureau of Yards and Docks, U.S. Navy. February 1959. 146 pages. (Order PB 151613 from OTS, U.S. Department of Commerce, Washington 25, D.C., \$2.75.)

Provides information to aid in obtaining the basic data on the structural properties of underlying soils. One part of the manual covers the field of basic soil engineering and its principles including the general requirements for soil data and exploration and the tests needed; another section describes the elements of soil mechanics, such as earth stresses and settlements. A section is devoted to earth pressures, their control, and their effect in relation to bearing piles, tunnels, conduits, and braced cuts.

The final section covers engineering principles and their application to the design and construction of earth structures, such as embankments, levees, and earth dams.

ICE MELTING PROPERTIES OF CHLORIDE MIXTURES. Bulletin 220. Highway Research Board, 2101 Constitution, Washington, D. C. Price \$0.50.

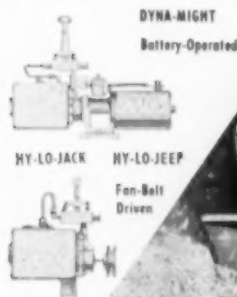
This 24-page bulletin contains two papers given at the 38th annual meeting of the Highway Research Board on this question of major importance to maintenance personnel, especially in states of the snow and ice belt.

fast, dependable snow plow action

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HYDRAULIC CONTROLS

Lift and lower the snow plow right from the cab . . . automatically . . . with Monarch Power Hydraulic Controls. Snow removal is easier, faster, more economical with Monarch. Instant up-and-down action with the flick of a wrist. See your dealer or write for illustrated folder.



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32

Engineering Study of Snow Hydrology

A reference book summarizing the knowledge of snow hydrology resulting from cooperative investigations of the Corps of Engineers, U.S. Army and the U.S. Weather Bureau has been published for sale by the Office of Technical Services, U.S. Department of Commerce. The book, PB 151660 *Snow Hydrology*, Corps of Engineers, U.S. Army, 621 pages, \$8.00, may be ordered from this agency at Washington 25, D.C.

ROADSIDE DEVELOPMENT. Report of Committee on this subject embodying ten papers and general discussion as presented at the 38th Annual Meeting, Highway Research Board, January 1959. Available on request to the board, 2101 Constitution Avenue, Washington, D. C. Price: \$1.20.

HIGHWAY INVESTMENT AND FINANCING. Bulletin 222, Highway Research Board, 2101 Constitution, Washington, D. C.

This 79-page bulletin contains 4 papers on the subject given at the 38th Annual meeting of the Board. Available at \$1.60.

EMBEDDED FLEXIBLE METAL PIPE CULVERTS: COTTON AND DEFORMATION. Bulletin 223, Highway Research Board, 2101 Constitution, Washington, D. C. Price 50c. Contains two papers on the subject given at the 38th annual meeting of the Highway Research Board.

STANDARDIZATION OF HIGHWAY BRIDGES. Technical bulletin No. 244, 1959. American Roadbuilders' Association, World Center Building, Washington, D. C. Price \$1.00 per copy or discount for quantities. Single copy free to ARBA members in good standing.

HOW EXPRESSWAYS HELP MICHIGAN AND YOU. A readable booklet with diagrams, maps and photos, telling the public of the economic and safety impact of expressways, based on studies for the Michigan Good Roads Federation.

California Budget Holds Strong

The California highway commission has adopted a \$569,243,867 state highway budget for the '60-'61 fiscal year. It contains \$452,784,507 for state highway construction purposes including rights-of-way.

This compares with the current ('59-'60) fiscal year budget of \$610,711,852 (\$497,000,000 for construction and r-w) and reflects the relatively minor impact, in the case of California, of the reduction in the federal highway apportionment on the state's roadbuilding pace.



Mainframe-mounted ripper is compact and rugged. Pressure applied to its shank and points tends to compress the grader tires, for even better traction and increased ripping efficiency.

NOW AVAILABLE...Rear Rippers for LW Graders

Available now, for use with LW 550 or 660 motor graders, is this new heavy-duty ATECO ripper. Attached to the rear of a big LeTourneau-Westinghouse grader, it breaks up heavy and tough materials, at fast speed... gives new versatility to motor graders.

Easily and quickly mounted to LW's massive, one-piece frame, the ripper operates through the grader's hydraulic system. Its shank shape and point angle... teamed with the power and weight of the "550" or "660"... provides quick penetration, to any depth up to 12 inches. The ripper greatly increases the usefulness of your LW grader, and makes it a one-man "wrecking" tool that will let you handle more work at a saving in time and equipment.

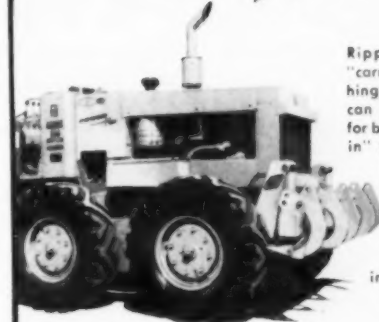
Fully-tested, fully-approved

This new attachment was engineered especially for the LW 550 and 660 by ATECO, a pioneer designer and developer of ripper attachments. The unit has been made available only after months of testing and successful application on LW graders, where it proved its money-making potential.

This new money-saving attachment is available with several different shank shapes, for various jobs, and can be mounted to "660" or "550" graders in the field, or purchased as optional equipment with new graders. Ask for full details.



Operator has complete and accurate control, can "scalp" asphalt pavement faster than with any other tool. With rear-mounted ripper for high-speed work in tough materials, and front-mounted scarifier for work around manholes and other obstructions, LW 550 and 660 graders add to their usefulness.



Ripper is shown in raised "carry" position, using one hinge pin. Unit's raised shanks can also be pinned rigidly, for bank, corner, or any "back-in" type work. Ripping is a logical utilization of the excellent power and traction characteristics of the big LW 550 and 660 graders, which offer 123 and 145 hp in "straight-shift" models, and 160 and 190 hp in POWER-Flow[®] torque-converter models.

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Firestone Giant Tire Service keeps equipment working around the clock

Firestone's Giant Tire Service puts a Firestone off-the-highway Tire Expert on your job whenever you need him. With his completely equipped service truck, he'll handle all your tires from the biggest to the smallest. He'll check your tires regularly for proper inflation and spot potential trouble areas before they develop. Combine Firestone's Giant Tire Service with Firestone off-the-highway tires to bring down tire costs. There's a tubeless or tubed tire built with Firestone Rubber-X, the longest-wearing rubber ever used in Firestone tires, for every construction job. Call your Firestone Dealer or Store about Firestone's Giant Tire Service today.

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Wide Base

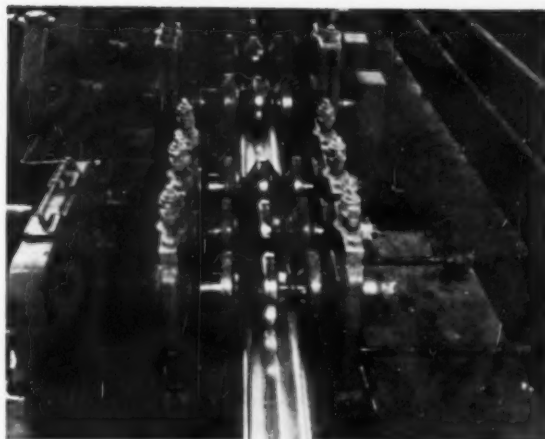
Rock Grip Excavator



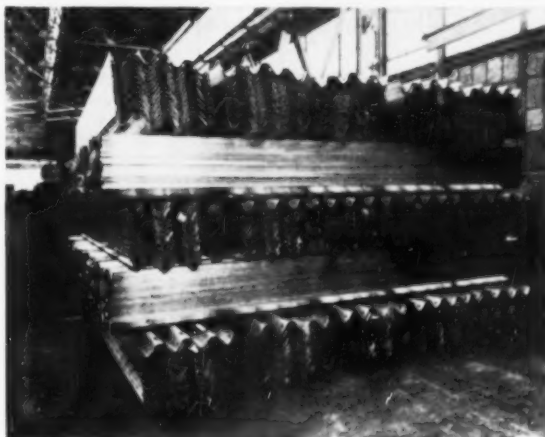
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Cold-formed steel highway beam guardrail rolled from continuously hot-dip galvanized strip steel emerging from forming rolls, at Bethlehem's Lackawanna shop.



An order of continuously hot-dip galvanized, cold-formed highway beam guardrail stacked and awaiting shipment. (Bethlehem Steel Company Photo.)

More Durable Guardrail From New Process

Formed steel beam highway guard rail is installed to withstand impact when struck by a motor vehicle out of control, and thereby reduce the possibilities of a serious accident. The success story of this product of the steel industry is too well known to need testimony.

Until recently the maintenance of steel guard rail has entailed considerable expense. Usually painting on a scheduled basis has been the answer, but there has always been a certain amount of deterioration due to the action of the elements—snow, rain, air-borne agents, etc.

The obvious answer to the corrosion problem is zinc galvanizing, and for the past year or more galvanized beam guard rail has been produced and marketed, with marked success.

Firestone

BETTER RUBBER FROM START TO FINISH

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ROADS AND STREETS, December, 1959

HEADQUARTERS FOR YOUR BEST BUYS IN USED EQUIPMENT!

Your Caterpillar Dealer's lot holds the best selection of used earthmoving equipment buys on the market. Here's why: His business is active—and he reconditions, classifies and guarantees his trade-ins so you *know* what you're getting. Here's how:



1 A "BONDED BUY" on used Cat-built equipment is your safest buy. It's a bonded guarantee, up to \$10,000 of satisfactory performance on *all* parts during the guarantee period.

2 A "CERTIFIED BUY" covers units of any make in good condition. This type of protection carries your dealer's written guarantee of satisfactory performance.

3 A "BUY AND TRY" deal is just what its name implies. This protects you with your dealer's written money-back agreement.

Only Caterpillar Dealers offer this protection. You'll find your dealer listed in the Yellow Pages. For your best buys in used equipment, visit his lot today!

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**BEST BUYS IN NEW
AND USED EQUIPMENT**

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This Construction Sign Makes Sense



You can't be a sidewalk superintendent when you're driving a car. That's the idea printed up by this sign on Highway 66, about 20 miles south of St. Louis, Mo. The new Interstate Freeway 44 is being constructed in the area, and drivers are cautioned to keep their eyes on the road instead of the road construction, lest they wind up in need of extensive repairs.



Highway C. & C. Job Averaged 1,000 Feet Daily

Heavy vehicular traffic, maintained during a road widening operation just west of Tuskegee, Alabama, failed to slow concrete curb and gutter construction by Gadsden Concrete Company, Gadsden, Ala. This firm with the prime contractors, joined forces for a 7-mile-long

bituminous pavement widening project on Alabama US 80.

The Gadsden firm averaged 1,000 lin. ft. per day in placing 37,000 ft. of curbing and gutters. Shown here is one of the Blaw-Knox Hi-Boy truck mixers used by Sharpe Sand and Gravel Co., Tuskegee, to supply concrete. Concrete was poured in Blaw-Knox curb and gutter forms—27,400 ft. of them employed.

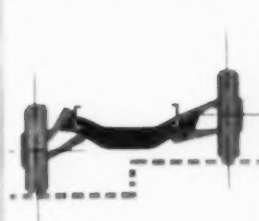
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**FROM OPERATION
"HIGH GEAR"**

**THE BIG GMC
BREAKTHROUGH**

**IN TRUCK ENGINE, CHASSIS
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THE INDUSTRY'S GREATEST
DESIGN, ENGINEERING AND
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This new B4000 Ninety-Incher is ideal for dump body, flat or other construction hauling. Available with 150, 165 or hp. V-6 engine. GVW to 23,000 lbs.

Biggest GMC Truck ever built—up to 120,000 lbs. GCW. BW9000 Series with 90" BBC offers contractors choice of Twin-Six gasoline or V-6 diesel power.



NEW CONVENTIONAL NINETY-INCHERS! This is the industry's first and only complete line of conventional-type Ninety-Inchers—19,500 lbs. GVW to the new giant-size 120,000 lbs. GCW. BBC is only 90". Front axle loading is ideal. Powered by four completely new V-6s, the revolutionary Twin-Six or modern V-6 diesels. Specially-reinforced double-life cabs. New easy-to-service four and six-wheel "Cost-Busters" for every construction haul.

MOST ADVANCED CONSTRUCTION



bed
180



New, roomy Custom Suburban carries 8-man crew or hauls bulky loads. Four-wheel drive model makes its own road to any job site regardless of terrain or weather.



This is the rugged, new GMC Custom 1/2-ton pickup with Wide-Body. Choice of 34 pickup combinations to meet construction use.

NEW CONVENTIONALS! Announcing the new distinguished Conventional GMCs with bold, practical styling! Completely new, exclusive triple-life V-6 engines with lowest-cost, longest-lasting performance! Bigger, sturdier built cabs! Easiest-handling, smoothest-riding, hardest-working trucks ever built! From the handsome 1/2-ton pickup to the capable 45,000-lb. GCW tractor, new GMC Conventionals are superior in every way.

N TRUCKS IN 20 YEARS!

*New steel tilt-cab six-wheelers have ratings of 37,000–52,000 lbs. GVW . . .
50,000–76,000 lbs. GCW. Versatile LW5500 Series shown in full-tilt position
with 7-yard mixer.*



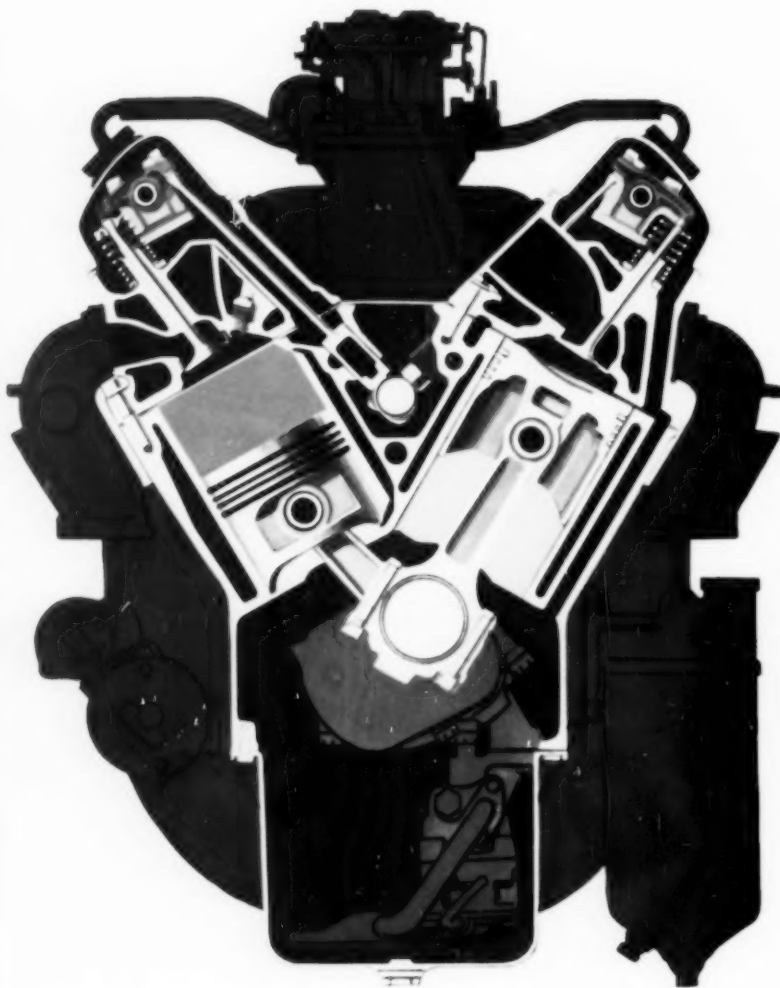
8-foot
t every

NEW TILT-CABS! For the first time—a complete new line of GMC tilt-cabs! 72-inch BBC with 52-inch front axle placement for bigger payloads, both volume and pounds! Powered by responsive, triple-life, high-torque V-6 and Twin-Six gas engines; and compact V-6 diesels! Full tilt completely exposes the engine for quick, easy servicing! Four and six-wheelers—19,500 lbs. GVW to 76,000 lbs. GCW.

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NEWEST, GREATEST ENGINE

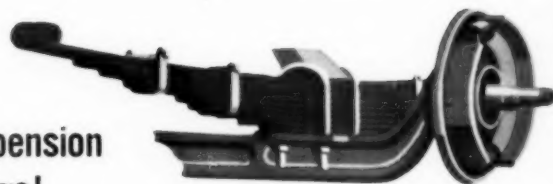


Coollest, Biggest Valves!

New GMC V-6 engines have three times better cooling (up to 176 gallons per minute) than all other comparable engines. Integral valve guides and the widest bridge between valves for the longest, most trouble-free operation. Less heat concentration, too, because no two exhaust valves are adjacent. Largest valves mean more work from every gallon of gasoline!



newest front suspension and springs!



Easier handling, smoother ride and less maintenance are all yours with GMC's new independent front suspension and torsion bar springs. One ride will convince you.

Larger models also have increased stability, shorter turning and improved handling . . . new, longer-lived, stronger I-beam front axles, wider spring centers and wider tread.

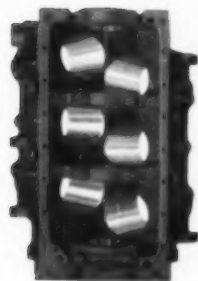
E ADVANCES IN 20 YEARS!

NEW V-6 most modern, most rugged engines built...out- last others up to 3 times longer!

Here is a completely new, more compact, stronger engine with the proved six-cylinder principle that produces full power over a broad range and at lower life-saving engine rpm. Actual tests have proved these new GMC V-6 truck-built engines last up to three times longer than other engines. Just a few of the reasons why are shown here. Ask your GMC Dealer for further factual, visual proof of the superiority of GMC's V-6 engines.

V-6 PERFORMANCE RATINGS

Model	Max. Horsepower	Max. Torque
305A	150 @ 3600	260 @ 16-2000
305B	150 @ 3600	266 @ 12-1400
305C	165 @ 3800	270 @ 14-1600
351	180 @ 3400	312 @ 18-2000
401	205 @ 3200	377 @ 1400



Strongest, Most Rigid Block!

GMC V-6 engines have staggered cylinders, extra-strong inner ribbing—plus full 3-inch drop crankcase skirts to eliminate distortion and deflection . . . add years of life to all components.

bigger brakes for surer stops!

Longer life, too, with increased lining areas. New centrifuse drum with steel outer shell and cast iron braking surface has greater heat transfer.

Steel tilt-cab (shown) also has the biggest windshield, best safety-vision, of any truck.



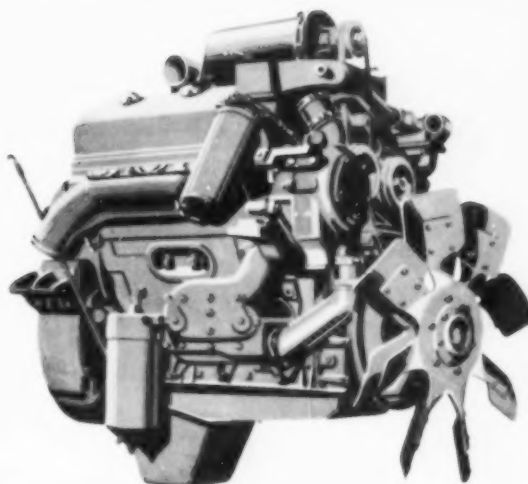
NEW GMC TWIN-SIX exclusive design, greatest power!

This new GMC Twin-Six engine has the most pulling power of any standard gas engine! Highest torque over a broader, low rpm engine range reduces shifting as much as 60%. Ample reserve power permits you to maintain tight schedules with higher average speeds.

Notice maximum engine speed is only 2400 rpm! This means less engine strain, higher performance, lower costs and longer life.

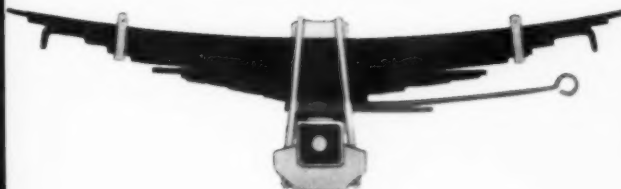
TWIN-SIX PERFORMANCE RATINGS

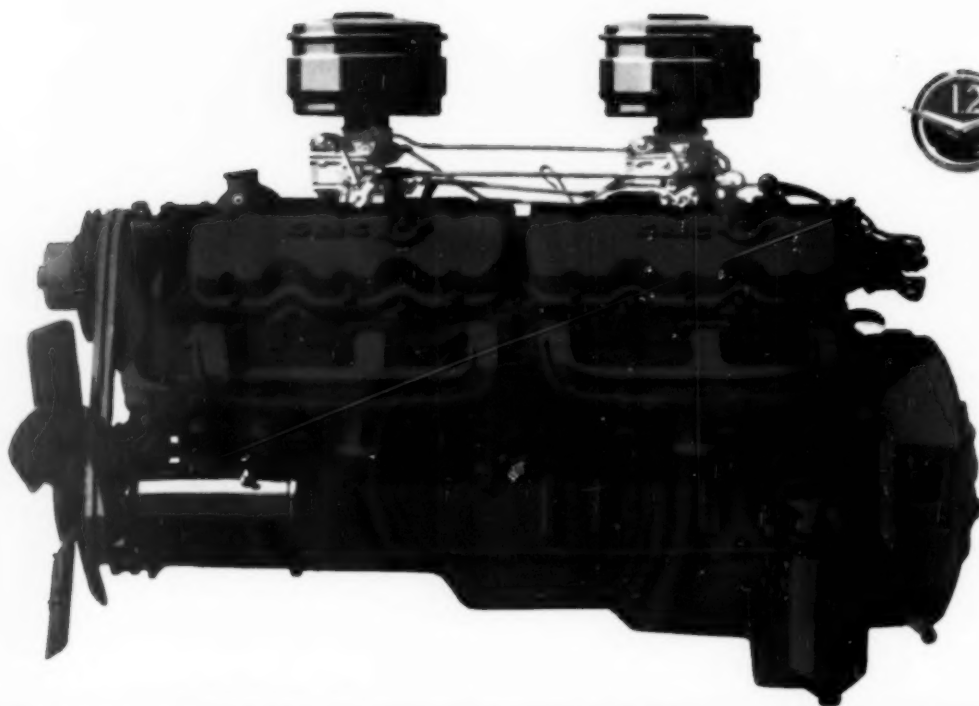
Model	Max. Horsepower	Max. Torque
702	275 @ 2400	630 @ 16-1900



new wider vari-rate rear springs!

Two-stage design and variable rate cam action provides a smoother ride, empty or loaded. Longer life, too, because radius rod leaf controls both torque and braking force. Springs only carry weight.





NEW GMC TRUCK V-6 DIESEL

lightest, shortest and most efficient!

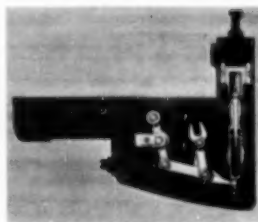
- Up to 530 pounds lighter than comparable horsepower diesel engines!
- Only 42 inches long — shortest of any 6-cylinder diesel!
- Two-cycle design for best performance and greatest fuel-savings!

With your GMC diesel engine and truck chassis, you get complete, convenient *one-stop* parts and service at your GMC Diesel Truck Dealer to save costly downtime and expense.

DIESEL PERFORMANCE RATINGS

Model	Max. Horsepower	Max. Torque
6V-71	189 @ 1800 or 210 @ 2100*	577 @ 1200

*Optional at no extra cost.



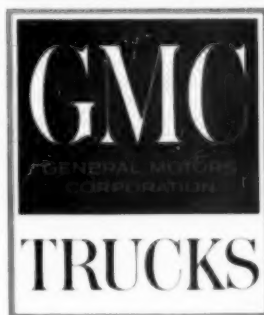
◀ Only GMC Trucks have this economy range governor that positively controls engine speed at most efficient point in top gears for outstanding fuel economy.

Save up to 5% on fuel and increase usable horsepower up to 7% automatically with GMC's exclusive hydraulic fan—standard equipment.



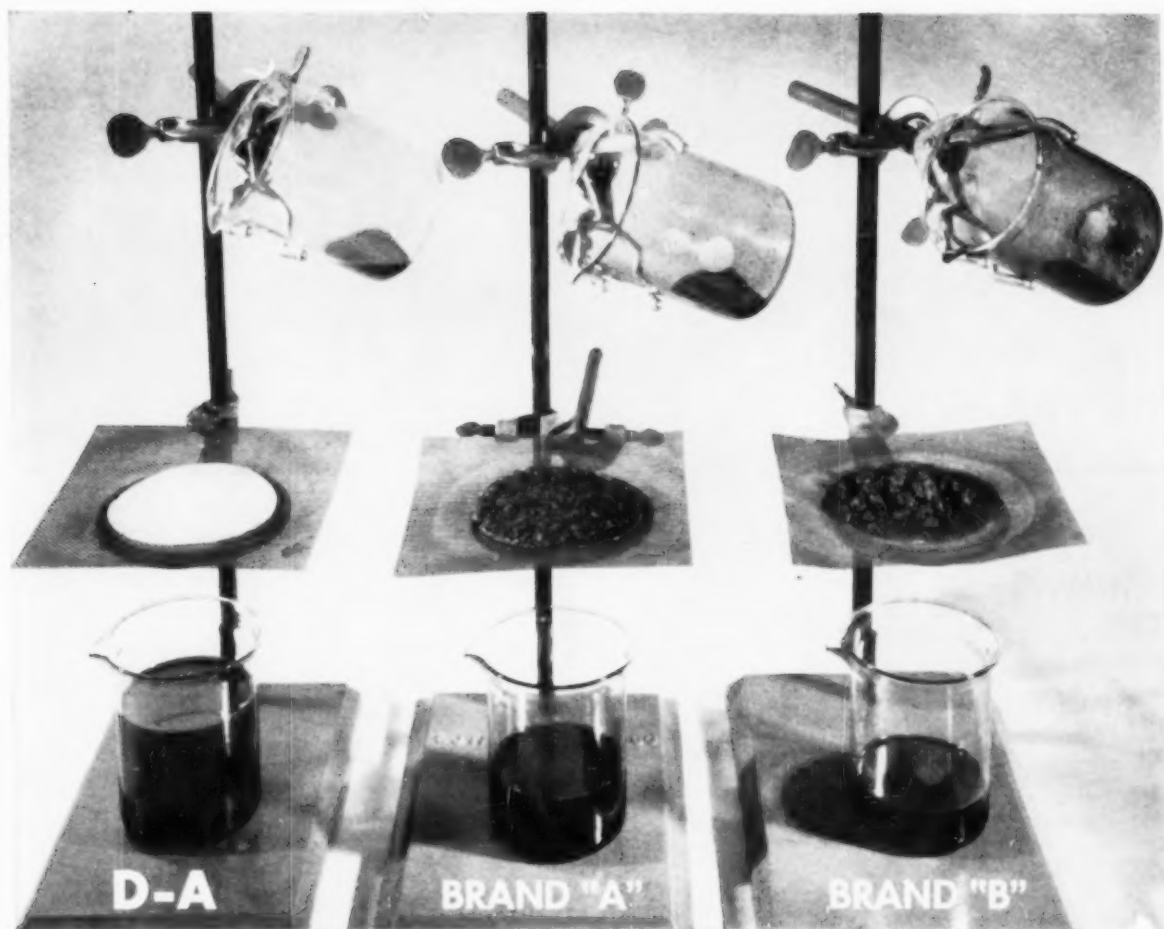
up to 35% stronger frames!

New design frames made of new materials are stronger and lighter to carry bigger loads of aggregate, dirt and cement dependably for years. 5500 Series and up have new, extra-strength SAE950 hi-tensile frames standard. New L-type reinforcements are also stronger.



From ½-ton to 60-ton
General Motors leads the way!

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Stop sludge, stop corrosion with D-A UNIVERSAL GEAR LUBE

The unretouched photograph above shows the results of a 24-hour accelerated oxidation or sludge test. On the right, two leading brands of gear lube are badly oxidized following the test while, on the left, D-A Universal Gear Lube remains clear, stable and capable of extended use.

Here's what this means to your operation: film strength is the element of a gear oil which prevents wear. To obtain high film strength, extreme pressure additives are placed in the lubricant. At a temperature of about 250° — often encountered in heavy-duty equipment operation — these additives can oxidize, as they

have in the competitive oils seen above. When this oxidation occurs, the oils become extremely corrosive and rapid wear results. Tests prove that D-A Universal Gear Lube does not corrode, even at temperatures as high as 300° F.

D-A Universal Gear Lube does not sludge or oxidize under high operating temperatures because D-A research has established successful means of retaining the stability of D-A's high-quality base oil while maintaining the high film strength necessary for extra-heavy-duty equipment operation. For greater protection of *your* equipment under heavy

load and high temperature conditions, specify D-A UNIVERSAL GEAR LUBE.



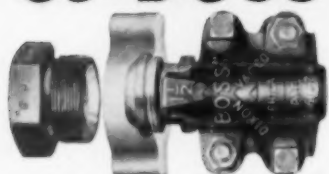
Lubricating heavy-duty equipment across the nation since 1919.

D-A LUBRICANT COMPANY, INC. • INDIANAPOLIS 23, IND.

ROADS AND STREETS, December, 1959

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"GJ-BOSS"



GROUND-JOINT FEMALE COUPLING, STYLE X-34

so *Reliable*
FOR PILE DRIVING

...AND ANY
STEAM, AIR,
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HYDRAULIC
SERVICES...
HIGH OR LOW
PRESSURE

Washerless



Unequalled for safety, efficiency and long service life. Ground-joint union between stem and spud provides leak-proof, trouble-free seal... no lost or worn-out washers to replace. All parts malleable iron or steel, rustproofed. Furnished with superstrong "Boss" Offset and Interlocking Clamps. Sizes 1/4" to 6", inclusive.

COMPANION MALE COUPLING

"BOSS"

STYLE MX-16



Companion coupling for "GJ-Boss", described above, and "Boss" Washer Type Couplings Style W-16. Each size fits same size hose... oversize hose not required. Furnished with "Boss" Offset and Interlocking Clamp. Sizes 1/4" to 6", inclusive.

"BOSS" HOSE MENDER, STYLE BM-16



The practical, safe way to restore damaged hose to service. Fitting consists of corrugated mender tube and two "Boss" Interlocking Clamps. Tube has flanges to engage clamp fingers. Thoroughly rustproofed. Sizes 1/2" to 6"

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One Crane Sets Prestressed Concrete Girders



Pew Construction Company sets 40-ft. prestressed concrete beams on this pair of 128-ft. twin highway-over-highway overpass. Location: junction of US 10 and new Interstate 90 near Tarkin, Montana. Pew's \$135,000 contract includes placing thirty-six 40-ft. and twelve 45-ft. prestressed concrete beams. The rig is a 35-ton Lorain Moto-Crane MC-530W, shown lifting one of the 10 1/2-ton units at a radius of 32 ft.



Ready-Mix From Batching Plant-on-Wheels

A construction area too small to warrant a stationary batching plant was developed into a profitable new ready-mix market by use of a batching plant-on-wheels. Transported from an Air Force Base runway paving job at Oxnard, Calif., to Long Beach, Calif., a Noble-Mobile batching plant supplies concrete for construction of the new boat ma-

rina and commercial and residential building in the rapidly expanding Long Beach area.

Located seven miles from the nearest stationary plant and operating on short hauls, the portable Noble plant recently batched up to 100 cu. yd. per hour of transit-mix concrete for the 15,000 cu. yd. marina job. This Long Beach ready-mix operation is one of 12 maintained by Mountain Ready-Mix with main office in Fullerton, Calif.



Protect against accidents like this!

*Use straight Morton Rock Salt—the most effective way to help
keep streets, freeways and tollroads safer in winter*

Straight Morton Rock Salt does the job abrasives and Salt mixed with abrasives can't do to help prevent accidents caused by ice and snow. Morton Rock Salt gives *abrasive traction* against skidding even before the salt starts to melt the ice. Rock Salt crystals are larger than other commonly used ice melting chemicals and *penetrate ice deeper* with a corkscrew action—not just melt surface ice. Due to Rock Salt's better penetration, it reaches the pavement fast and quickly *melts* the bond between ice and the street surface.

Morton Rock Salt is safe, clean, economical

Straight Morton Rock Salt is non-toxic. It does not damage animals' paws, rubber, fabrics, leather, asphalt, brick or properly seasoned concrete. It will not clog sewers or leave a rutted, dirty pavement as will sand or cinders. What's more, Rock Salt melts *more ice at lower cost* at any temperature above 8° F. than any other commonly used ice melting chemical.

Send for more information today!

- ☐ Please send me your free book on ice and snow removal.
- ☐ I would like a Morton representative to advise me on how best to stockpile Morton Rock Salt.

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Imports Spur Steel Efficiency Studies

In the face of record imports of foreign steel and inroads by rival metals and nonmetallic products, the iron and steel industry's best defense is a strong program to reduce its costs. This was an opinion presented by Max D. Howell, executive vice president of American Iron and Steel Institute at the institute's regional technical meeting in Chicago October 14.

"The competition of foreign steel producers is being felt to an increasing extent in the Great Lakes areas," Howell said. "Over 260,000 tons of foreign steel came into the customs districts of the Great Lakes in the first seven months of 1959, compared to 46,000 tons same period 1958."

With foreign steel holding a definite price advantage, Howell said that the technical men in the steel industry have challenging opportunities to improve present processes and develop new methods.

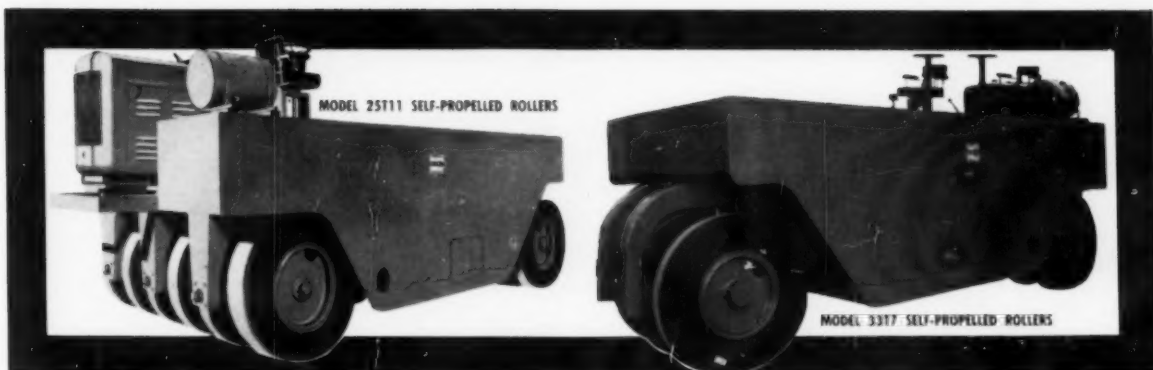
W. A. Black of Republic Steel Corporation reported that scientific non-destructive testing methods can help reduce an estimated \$100 million per year that is spent by steel companies in the inspection and conditioning of semifinished steel products. Black is assistant director of research at Republic's electro-mechanical research center in Cleveland.

Achievements have been made in solving steel plant problems by the use of automatic data processing equipment, according to W. N. Spray, manager of methods and procedure, production planning, United States Steel Corporation.

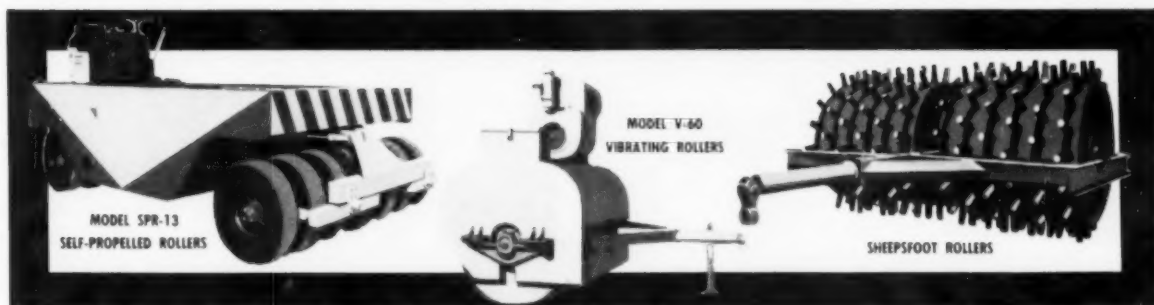
Toll Traffic Up

Traffic on toll highways, bridges and tunnels throughout the nation rose an average of 8.6 percent in the first nine months of 1959 compared to a similar period in 1958. So reported the American Bridge, Tunnel and Turnpike Association, Inc.

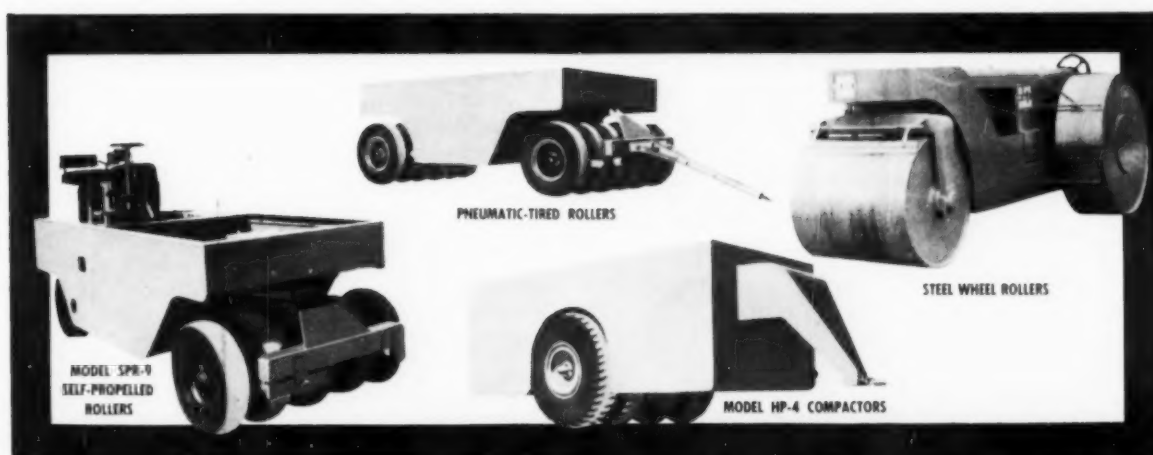
Traffic rise on individual facilities varied greatly. Best jump in patronage for a major facility was reported by the Connecticut Turnpike, up 101.5 percent. Numerous other major turnpikes reported 10 to 20 percent gain. Smaller projects including isolated tunnels and bridges average smaller gains.



Look to Browning for the most complete lines of dependable compaction equipment available...anywhere.



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**Rotates from Left to Right Hand
Plowing Position IN 15 SECONDS**



On runways and thruways, modern time tables depend on fast, efficient snow removal. The Frink Roll-Over Sno-Plow fills this need . . . works full plowing time because it can be reversed from left to right position in 15 seconds! No deadheading! Hydraulic controls in the cab quickly reverse the plow to throw all the snow in the direction dictated by the wind and disposal area location. On dual highways, the Roll-Over can discharge left, yet travel with the traffic.

This unique plow, with curved, tapered mold-board, operates safely at high speed . . . throws and spreads snow to eliminate high banks and subsequent drifting. And when the job is done, quickly and economically, the Roll-Over parks upright within its truck's width. For full details, write to Frink for catalog.

Other dependable Frink Sno-Plows (V-Type, One-Way and Reversible) can all be attached to the Roll-Over's lifting device assembly.

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It Pays to Think of**

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SNO-PLOWS**

**FRINK SNO-PLOWS, INC., CLAYTON, N. Y.
Eastern Steel Products, Ltd., Preston, Ontario-Canada**

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50



Close up of the open fabric.



Workmen applying fabric on a highway installation.

Open-Mesh Fabric Helps in Landscaping

An open-mesh fabric was used recently to hold down straw mulch on a freshly seeded highway slope, with good effect.

The contractors Fruin-Colnon Contracting Company, St. Louis, used the method on a road job, the cost for the fabric at 4.5¢ per sq. yd. of area covered and about 1,600 sq. yd. being used to protect the embankment slopes. The fabric was rolled out over the ground and staked down firmly with wood pegs to anchor the straw mulch.

In addition to anchorage the mesh serves to help catch and hold moisture to hasten growth while preventing washouts. The mesh was furnished by Bemis Bro. Bag Company.

GIRARD MACHINERY & SUPPLY CO., San Antonio, Texas is a new distributor for Highway Equipment Company, Cedar Rapids, Iowa. Girard will handle the HI-WAY line of ice control spreaders and bituminous paving equipment.



Lima
Austin-Western
Model 4248
overhead
eccentric
roller bearing
Jaw Crusher



LIMA A-W 42x48-in. Jaw Crusher produces more rock for less

Speed up crusher output with giant Lima Austin-Western 42 by 48-in. overhead eccentric roller bearing Jaw Crusher. Quality built to outperform! Oversized shafts and roller bearings for extra strength and durability. Extra-deep jaws of tough manganese steel form smaller, sharper and more efficient crushing angle.

main frame is practically unbreakable. Low alloy, high strength 3-in. steel plate gives frame tremendous strength in proportion to its weight.

flywheels are heavy castings, precision machined to proper balance. Split-type hubs simplify flywheel removal. Flywheels are key-locked into place, can't back off in operation.

pitman and shaft assembly can be easily removed through crusher frame top. Cartridge-type housing holds assembly in place, eliminates possibility of loose bearings.

bearings—Both main and pitman bearings are oversized and self-aligning to permit some shaft deflection, and deviation is minimized by locating the bearings close together. Frame absorbs part of shock load as main bearing center lines are within sides of main frame.

Bearings are protected by a simple-type steel labyrinth seal which resists entrance of dirt and seals in lubricant. Bearings may be easily removed by use of a hydraulic system furnished with this model.

capacity—What the Model 4248 can do for you may be seen from the fact that it handles 240-360 tons an hour when set at 5-in. discharge opening; estimate based on 2700 lb. per cu. yd.

Lima Austin-Western also produces a complete line of crushing and screening equipment and portable and stationary plants. Other smaller sizes of roller bearing Jaw Crushers are also available.

Profit from our 73 years' experience manufacturing Jaw Crushers and equipment for pit and quarry. Engineered and built to produce more rock at less cost! See your Lima Austin-Western distributor now or write us for free bulletin.

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ABOUT DAVE PARRO

33 yrs. old . . . Graduate of University of Illinois. A stickler for details . . . worked in every phase of construction before own business. Built volume from \$50,000 to \$1,500,000 in 4 years. Surrounds himself with young men, open to new ideas, who can share his enthusiasm. Considers Jeff Combs a member of this group.

ABOUT JEFF COMBS

33-yr.-old Cities Service Lubrication Engineer. Graduate of Purdue University. 7 years' experience in solving field lubrication problems. Loves the challenge of field work. Believes personal service is biggest factor in gaining and keeping customers—has been known to drive several hundred miles to achieve this goal.

"Sometimes we feel we're in business with Cities Service,"

... says Parro Construction Corp., Urbana, Illinois

33-year-old Dave Parro, who built a \$1½-million business from nothing in four years, attributes his rise to constant attention to details and praises Cities Service for the same.

"The fact is," remarks Parro, "our Cities Service Lubrication Engineer, Jeff Combs, gives us so much of his time and attention, I often feel we're in business together."

"Wherever we go, Jeff is there to assist with every detail of lubrication . . . and we follow his recommendations to the letter. For we've found that by doing so we achieve a degree of operating efficiency that is directly reflected in our competitive bidding. With attention to details like this, we not only win contracts, but achieve maximum profits with each job."

Mr. Parro touches on a vital point. Today, as bids become increasingly competitive, details like flawless lubrication can very well mean the difference between profit and loss on the job. Through superior products and on-the-spot field experts, Cities Service can help you stay on the profit side of the ledger. For details call the nearest Cities Service office or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.



"Our Fuels and Lubricants Carry A Big Work Load, but thanks to Jeff Combs' recommendations, there's never a failure. Trucks are serviced where they stand."

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Highway Leaders Must Keep the Initiative

Even old-timers came away from the Boston AASHO meeting somewhat dazed at the quick turn of the climate. Only a year ago the concern was to get roadbuilding further into high gear, following the mandate to roll with the Interstate and other programs.

Now suddenly the road effort is in a new position: moderate cutback, new distribution formula, contract control, and—most important—a re-appraisal, particularly of the Interstate part.

Several timely observations, passed along from respected sources:

First, the things that will come out of the new White House planning committee and the two new special Congressional investigating committees will, in the long run, and even perhaps the short, be good for the highway program. Bureau of Public Roads and highway department leaders have an opportunity to show real statesmanship. They will be watched for their ability to constructively cooperate with the committees: to help appraise their own planning and design effort objectively in the light of new concepts.

A second point has to do with forthcoming committee sleuthing for evidence of waste, graft and fraud. There never was an apple barrel without some bad apples, and the forty-eight state capitols have not all had good clean traditions of government.

The federal-aid road program however as a whole is sure to emerge with a remarkably clean bill of health. Down through the years it has been one of the best safe-guarded public-spending programs.

Third, we must realize afresh that highway system building today is not just physical engineering, but an undertaking requiring integration of engineering, social and economic planning, and other broad projections. The Bureau and the states have had to plunge in on freeways, often without any real planning cooperation from the communities involved. If the Interstate program is now to be "de-urbanized," design standards revised, or a new tax base sought, the policy decisions must not be pat committee pronouncements. Those affecting engineering can be made soundly in only one way, i.e., with *engineering* data. Real decision must await the 1961 study reports. Any other way, the price will be high indeed.

Fourth, the highway administrators, caught in a cross-fire from the Administration and Congress, must now gird to fight for what they think is right for the nation. Roadbuilders finally have begun to make important inroads on congestion and highway obsolescence. The freeways in, around and between cities will be found, in the main, to be soundly planned. A detailed analysis of the advance financial, economic and traffic planning that has gone into these facilities, such as Roy Jorgensen presented at the Boston AASHO, should be made available to the new investigators. It should open their eyes.

Whatever else, highway professionals must be permitted to keep the initiative if the nation's highways are to be developed soundly for the explosive growth that lies ahead.

Harold J. McKeever



←
One of the big yardage producers at Chantilly: "Euc" loader and wagon spread, seen working in ripped and blasted shale with results that "proved it could be done".

Shale Excavation Methods at International Airport

Jagged, sharp-edged shale put C. J. Langenfelder's "show case" earthmoving fleet to the test in million-yard-per month grading project.

The new International Airport at Chantilly, Virginia, just outside Washington, D. C., has made news among the contractors from the start. Bidding was keen for the two contracts awarded in autumn 1958—and the pace set by the successful bidder, C. J. Langenfelder & Son, Baltimore, Maryland, has kept the project in the spotlight.

Langenfelder's two contracts, awarded in October and December last year, were for a combined \$18,807,333. The job: clearing a 9,400-acre rolling site, grading, drainage and paving for three runways, related taxiways, and grading for apron and terminal areas.

One of the largest earthmoving jobs in eastern U.S., the project requires 10,600,000 cubic yards of unclassified excavation, plus another 400,000 added for an additional bid drainage ditch. Contract No. 1's 8,200,000 cu. yd. is running 30 percent rippable shale; Contract No. 2, with 2,400,000 cu. yd., 40 percent rippable shale plus some 200,000 cu. yd. of blasting for a large drainage ditch and spot removal. The added ditch also has made work for the blasters.

The project was expected to be a showcase for the latest equipment—and it has been made good in this respect. With only 180 days allowed for

grading the first runway, and 270 days for all work, Langenfelder moved in a large fleet including, among other items, one of the new LeTourneau 100 cu. yd. double-pan scrapers. Accompanied for a time by factory experts with stop watches, this unit received a prolonged workout.

A Michigan 480 rubber-tired tractor also helped the crews make good early-season yardage as a push-loading unit.

After a small start before December shut-down, Langenfelder began again on March 2, and by August 2 moved 5,000,000 cu. yd. in the five-month period. The accompanying layout of cut and fill areas shows the spread-out nature of the job—no unusually deep cuts or fills. Project strategy has been geared to the existence of shale under most of the field, and the equipment fleet picked accordingly. In general, the work has been to strip about ½ feet of topsoil, go through two or three feet of clay, then get into the shale. Shale varies from soft to hard and in the main has been ripped and removed with scrapers. Data from Langenfelder's advance borings led to an estimate of the shale as 80 percent rippable. The percentage has been slightly less than this.

Daily production of about 50,000 cu. yd. has been

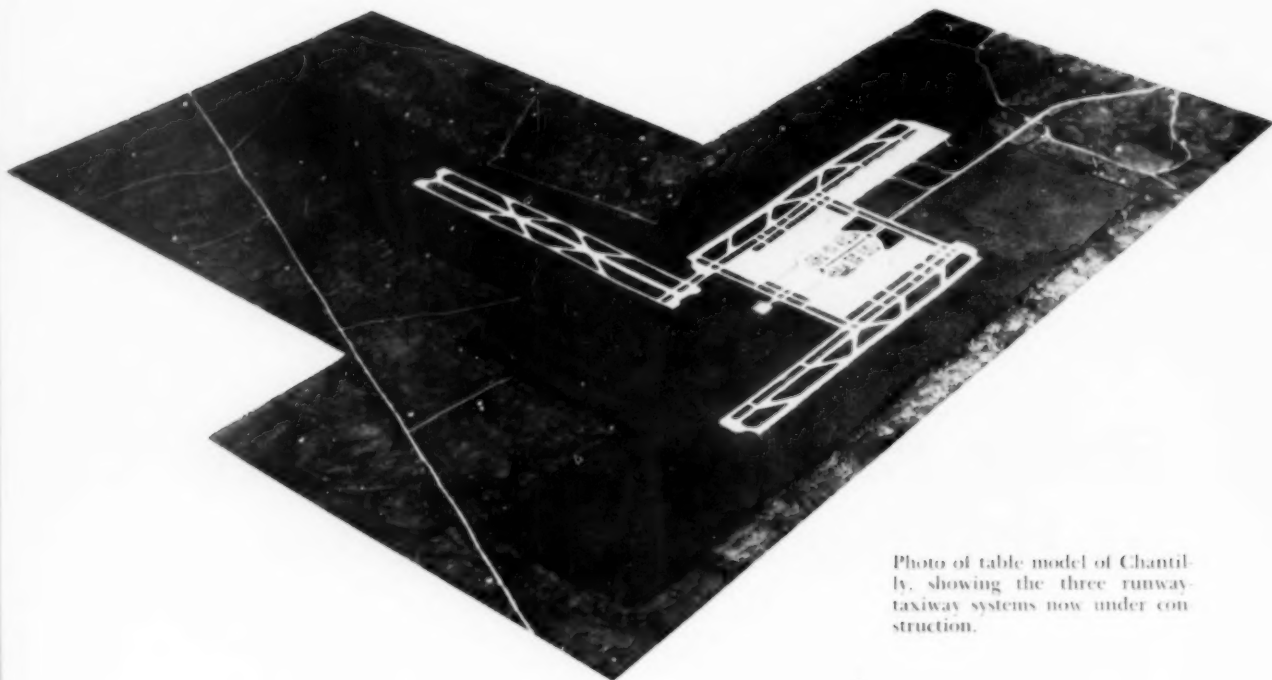


Photo of table model of Chantilly, showing the three runway-taxiway systems now under construction.

maintained. This yardage, is the output of five and later seven basic spreads: one of Caterpillar DW 20 and DW 21 scrapers; one crawler tractor-drawn pan outfit; two Euclid belt loaders serving bottom-dumps; and a team of Euclid TS 24 twin-engine scrapers.

Shale Removal Methods. Most interesting aspect of the earthmoving has been the shale removal. Ripping will be required for 2,500,000 cu. yd. This operation in advance of the various spreads is centered largely in Cat D9 tractors with Cat (2-tooth) or Sheppard (single-tooth) rippers. One and sometimes two tractor-rippers loosen about 6 in. depth at a time, also doing dozing or push-loading at times. Shale has been loaded with little difficulty, once ripped, although tandem push-loading has been resorted to. The twin-engine Euclids have been given pusher assistance in shale, and for a time the Michigan 480 tractor got behind these scrapers. The top decomposed layers have often been loaded without ripping.

A problem of the field management has been to keep an intensive watch on all spreads in shale or clay, so as to keep a balance of equipment. Supervisors' pickup trucks carry not only radio-telephone but also loud speakers, expediting instructions to operators.

Compaction Problems. As might be expected with clay and shale, in an area of frequent summer rains and relatively high ground water, securing of required density has been a problem at Chantilly. No mixing of material has been necessary, and all cut material has been usable for filling. The

chief dependency is on sheepfoot rollers, drawn by heavy crawler tractors in the rough going. One 50-ton rubber tired compactor has helped iron out lifts. The specifications have required the usual ratio of rollers on hand per unit of fill production; otherwise the contractor has had a free hand.

Proof rolling, required for grade acceptance, is done with a 100-ton rubber tired compactor drawn usually by a D9. Rome discs have had a workout aerating wet soil and breaking it down for better compaction. Discs are required by specifications for fills exceeding 4 ft. depth. Final dressing of the grade preparatory to placing base lifts is done by blades and a Buffalo-Springfield Kompactor.

Compaction requirements are 98 percent under pavement areas and 90 percent elsewhere, as measured by AASHTO Test Method T 99, modified.

Big Drainage Ditches. Drainage for Chantilly has been a major undertaking in itself. Nearly 14 miles of reinforced concrete pipe is being installed by conventional methods of trenching with back-hoes or ditchers. These drains lead into three large open ditches.

One ditch, 6,500 ft. long by 300 ft. wide at the top, will divert a stream around a runway area, requiring 700,000 cu. yd. of excavation. Another ditch, 15,000 ft. long and varying in bottom width from 12 to 60 ft., will carry drainage two miles around Runway No. 2. Loading is by P & H 3½-yd. and Northwest (80D) 2½-yd. shovels with Euclid wagons and rear dumps.

Continued on page 108

An Administration spokesman reports top-level re-evaluation of the multi-billion-dollar Interstate program, particularly of urban segments, is under way. But, he promises, roadbuilding volume will continue on a high level.

Road Program Enters New Policy Environment

There will be a top-level re-evaluation of the National Highway Program. There will be a tightening up of financial management of the multi-billion-dollar undertaking. But there will be also a continued high-level of highway construction for the roadbuilding industry to look forward to.

These were major points amplified by John Allen, Under Secretary of Commerce, in an address before a Michigan highway industry group last month.

His speech was the first candid revelation that the Administration does indeed intend to tailor the highway program for fitting into the Eisenhower budget.

Aside from superficial observations at irregular times, and isolated partisan jabs at deficit highway financing, the Administration has exerted little real direction of the accelerated road program heretofore. The result has been that the multi-billion-dollar undertaking has moved forward at an uncertain pace.

Mr. Allen made it clear that the President intends to re-appraise the program, and he candidly indicated what Mr. Eisenhower's policy would be in influencing the course of the big program over the next few years.

The National Highway Program is no longer "small potatoes," Mr. Allen pointed out, to be left to run its course independently and without reference to the large problems

of 1) national fiscal policy, 2) overall urban planning, and 3) federal-state responsibilities. The highway problem has emerged as a major concern of government policy, he pointed out, and "having become a major issue of government policy, highway policy must now be coordinated with other major government policies.

"Highway policy must compete for resources, for funds, and for the attention of our highest officials."

During the last year, the road program has moved from an area of relative obscurity into the "principal centers of political decisions," he said. In Congress, this means that the highway problem has been forced to the attention of the most powerful committees and it now requires the appraisal of the "highest levels of Congressional leadership." Highway legislation can no longer be proposed in any one committee without an evaluation of its treatment in others.

In the Executive Branch, the Department of Commerce and the Bureau of the Budget have become increasingly cognizant of the drain upon the Treasury of highway construction expenditures—"a problem of unparalleled severity," Mr. Allen declared.

"Part of our problem today with the financing of the highway program has been due to the failure of many people to realize the new policy environment of highways,"

Mr. Allen noted. "In a large measure, the Federal-aid Highway Act of 1958 was passed without reference to other policy needs than highways. It was superficially tied to the then current problem of economic recession."

"But," he said, "the 1958 Act was a pure reflection of highway policy, made without reference to the broad financial problems of the country—either at Federal or State levels—without reference to an orderly planning of a long-range program, or without reference to the broader needs of State and local government for orderly planning of public facilities."

"We have just been through the 'morning after' the 1958 highway binge. We have found that we have inherited a basic management problem that knows no parallel in highway history.

"We have allowed ourselves to incur liability for expenditures far in excess of our ability to pay in the near future," he said, "even with the increase of one cent in the motor fuels tax."

There still is no orderly financial program for accelerated highway development, and the Administration has been handed a management problem to solve as best it can," he said. "We are proceeding with extraordinary means of solving it."

Even with the institution of these "extraordinary means"—obviously
Continued on page 111



The Mengel Company's spreader pushes the truck ahead while carrying ready-mix concrete out over the roadbed on a swinging conveyor belt.



Plant production kept two to three trucks waiting at spreader to insure steady pace.

Novel Spreader Sparks Central Mix Paving Job



With a self-propelled spreader, and with equipment designed only for 12-ft. slabs, Mengel moves across structures speedily. Here, the company's Schield-Bantam truck crane totes an R-B subgrader.

When a ready-mix operator gets a chance to further the cause of ready-mix concrete for highway paving, can he come through in performance and still make money on the job?

One answer would seem to be yes—(1) if he has a batch plant that can combine accuracy and speed; (2) if he can maintain a fast truck cycle; (3) if he can get speedy discharge from trucks and placement of mix on the roadbed.

The F. F. Mengel Co. hit these targets on its Interstate project in Wisconsin during the 1959 summer. Mengel met dates and "made money" by using imagination in equipment, and by refining every detail of operation. Principal roles in this effort went to a portable automatic batch plant and a unique concrete spreader.

The Mengel Company, of Wisconsin Rapids, Wisconsin, maintains a commercial sand and gravel operation in its home city, along with a ready-mix plant and an asphalt plant.

The company began work June 15 on two contiguous contracts on

Interstate 94, the old Route 41 west of Kenosha. Contract 194-6(16)340 was for 4.1 miles requiring 116,000 sq. yd. of concrete pavement. North of this is 194-6(15)334, 6.5 miles, with 180,000 sq. yd. of concrete. The combined price was \$1,750,000. Mengel's work consisted of paving two 24-ft. lanes of 10-in. slab, the shoulders, also curbs, gutters and paving on access roads.

The Rex central concrete plant was designed to the ideas of job superintendent Bill Mengel. All units except the cement bin were rubber tire mounted. The three 37 cu. yd. aggregate bins were towed into position in a trench, and gravel ramps built up to them so that supply trucks could dump directly.

Each aggregate bin supplied its own 2 cu. yd. weigh batcher via a 24-in. conveyor belt. From the batcher the material was carried up a 30-in. belt to a charging hopper which fed the aggregate, water and cement to the trucks.

The fully automatic plant was operated by one man at a control panel. He pre-set specified weights for aggregates, cement and water

and then pressed an activating button for each batch. A mixer received two 3-yd. batches in 1½ minutes.

Maximum capacity for this plant was 180 cu. yd. per hour. Toward the latter part of the summer Mengel was running an average of 165 yards per hour or better in a 10-hour work day.

A special water technique was employed. Water for each batch was automatically metered into the charging hopper. This amount varied with the moisture content of the sand but was set 10 gal. short of specified quantity; 5 gal. was put into the drum at the paving site immediately following the previous delivery, and the driver put in another 5 gal. after the drum had been charged to flush any dry accumulations.

Mengel put down two wells with electric pumps to provide clean mixing water. Two tanks at the plant area held a reserve capacity of 23,000 gal.

The plant's 485-bbl. cement silo was backed up by a second silo with 600 bbl. capacity. The job's mod-



Mengel's automatic batch plant. The three portable bins are buried in order to build up a ramp for charging direct from trucks. Note operator at the plant's control panel, and ready mix truck taking a batch at extreme left of picture.



Illustrating the earth ramp aggregate dump for charging bins of the concrete plant. Freuhauf trailer with Hendrickson truck-tractor.

crate pace required 20 trailer loads of cement a day at an average 114 bbl. per truck.

Ten ready-mix trucks were used—International 190's carrying 6-yd. Rex front-engine power-takeoff mixers. With the plant situated between the two contract sections the trucks needed only 15 minutes' travel time for the 6¼ miles to the farthest point on the jobs. The haul

cycle averaged between 2½ and 3 trips per hour per truck.

Rapid plant production and efficient truck movement obviously would be stymied if discharge at the paving site were slow. To overcome this, Bill Mengel put together—and patented—a radically different spreader designed for ready-mix paving. The self-propelled unit, built up on an old tandem axle

truck frame, is rubber-tire mounted, does not ride the forms. From the operator's seat at the rear, a boom extends ahead some 25 ft., at which point the ready-mix truck backs into and engages a hook. With its axis here, a 20-in. wide belt conveyor rotates latitudinally out over the roadbed spreading the mix

Continued on page 67

CATERPILLAR'S PROGRESS REPORT

1959

NEVER before, in *one* year, has *one* manufacturer introduced a more impressive array of new heavy-duty earthmoving machines and major earthmoving developments than Caterpillar in 1959. All these new machines and developments, the dramatic result of Caterpillar's broad research and development program, have *one* common denominator: they pay off with faster, lower cost production than the earthmoving field has ever seen. They help you compete successfully in the most competitive construction market in history.

On the following pages you'll see all these machines and some of the developments. For the complete picture, see your Caterpillar dealer. Whatever your need, you'll find he has the *most productive* machine for it in his complete, modern, heavy-duty equipment line-up.

What about 1960? Caterpillar's multimillion-dollar research and development effort is a *continuing* program. That means you can count on *continuing* major equipment news from Caterpillar during the coming year. Keep your eye on Caterpillar in 1960!



Here they are— **CATERPILLAR'S NEW**



D9 Series E

Now the "King of the Crawlers" is better than ever with new capacity for higher, faster, lower-cost production on any big-tractor job. Here are some reasons why:

NEW UNDERCARRIAGE. Here's the "newest look" in this take-charge giant. Its undercarriage is more massive, more rugged than ever. And major improvements in all track components add hundreds of hours of life to running gear—hours that mean more time even on the toughest job.

STRONGER TRACK COMPONENTS. Bigger, heavier track links, shoes, pins and bushings give longer trouble-free service in roughest going. Increased link pitch from 9" to 10 $\frac{1}{4}$ " means added size and strength in all track components. New deep hardening steel gives up to 40% longer life to shoes, links and rollers.

NEW 335 HP (flywheel)—268 HP (drawbar). More powerful than ever, the D9's Turbocharged Engine has the capacity to handle bigger loads faster, with even greater dependability and economy. A new, compact Turbo-charger packs more air by weight into the engine and improves fuel-burning efficiency.

NEW EQUALIZER BAR. This important improvement in the D9 helps increase production, particularly on sidehill applications where the rocking action of the bar shifts more weight to the uphill track. Result: better tractor stability and increased operator confidence.

D8 Series H

Pacesetter in its tractor class, the new D8 Series H incorporates dramatic new engineering advances. Some are described here. For complete details, see your Caterpillar Dealer.

NEW POWER. The horsepower of the new D8 is up from 191 to 235 at the flywheel, from 155 to 185 at the drawbar. In addition, engine torque rise now is 20%, an increase of one-third. Over-all engine performance has been greatly improved by the addition of a Turbocharger.

NEW DIMENSIONS AND WEIGHT. The new D8 is heavier—it weighs 47,000 lb., over 2 tons more. It has 84" track gauge, 5,505 square inches of track on the ground with standard 22" track shoes. The new D8 has 19 $\frac{7}{8}$ " ground clearance—50% more than ever before—and the most in its class.

NEW LIFETIME LUBRICATED ROLLERS AND IDLERS. Rollers and idlers are lubricated at the factory and will require no further lubrication until rebuilding. Special metal floating-ring seals keep lubricant in, dirt out, for lifetime lubrication. Proved by over 5 years of testing.

NEW DRY-TYPE AIR CLEANER. Most efficient air cleaner ever developed. Removes at least 99.8% of all dirt from intake air during every service hour. Can be serviced in five minutes. Cuts maintenance time by as much as 75%. Efficient at all engine speeds and operating conditions.

SYNCHROTOUCH TRANSMISSION CONTROL

for DW20 and DW21 Tractors

An advanced new way to shift gears easier and faster. Operator simply dials desired gear for automatic, split-second, touch-and-go response!

This remarkable Caterpillar advance combines economical direct drive transmission with the easiest, fastest shifting possible. An optional arrangement for DW20 and DW21 Tractors, SynchroTouch Transmission Control permits effortless shifting of transmission gears by means of a gear selector placed near the operator's right hand.

To shift up or down, the operator simply moves a selector switch to the desired gear. In less than a second, it is engaged. The standard foot clutch is retained, but is used only when starting from a standstill.

Fully tested on the job, Caterpillar SynchroTouch Transmission Control gives you these important benefits:

- 1 Faster shifting—for faster cycles and more payloads per hour.
- 2 A big reduction in operator fatigue—for more daily production.
- 3 Economical direct drive transmission—uses standard DW20 and DW21 transmission and clutch components.
- 4 No special maintenance required.

See the DW20 and DW21 in action with this great new optional control!



CAT D7 SERIES D TRACTOR

Packed with more power and more features to deliver even more production at lower cost!

More productive ability and greater operating economy—that's the result of advances in the new D7 Series D to make it an even better investment than the efficient machine it replaced.

Here are some of the key features that put the new D7 way out front in its class. A new Turbocharged Caterpillar Diesel Engine develops 140 flywheel HP, 112 drawbar. Improved torque characteristics increase its lugging ability 80%. The D7 also features a new dry-type air cleaner, new



lifetime lubricated rollers, new lubrication system for transmission, new stronger final drive gears and optional in-seat starting. With all these and other new advances, certain time-tested features have been retained. To mention one, there's the exclusive oil clutch, which delivers 2,000 hours of service without adjustment.

For day-in, day-out hard work, no other machine of comparable size can match the new D7 Series D. It is way out in front of all others in its class!

New power, new capacity, more features and new ruggedness increase output as much as 22%!

Match the No. 933 against anything in its size. You'll be convinced; here's the most excavator-loader for your money!

**for D8 and D9 Tractors**

On-the-go shifts under full load in a split second. Changes speed, reverses direction with finger-tip control lever—and no clutching!

This rugged new transmission, with an exclusive new design, provides production highs never before possible with a track-type tractor. Here's why: 1. It combines for the *first* time the flexibility and anti-stall features of torque converter with the operating snap of direct drive. And because of its direct drive characteristics, it is more efficient than other power shift designs. 2. With one control lever and no clutching, it reverses direction . . . changes speed . . . smoothly . . . under full load . . . in a fraction of a second.

Power shift control is mounted to the operator's left. One selector lever (black knob) eliminates gearshift, forward-reverse and flywheel clutch levers. The safety lever (red knob) prevents accidental engagement. The selector lever moves in a "U" path to various positions. Shifting is so easy the operator just naturally gets more work out of the tractor even on the toughest jobs.

One ton of ruggedness. Cat power shift transmission stands up under the heaviest earthmoving duty. See it demonstrated on D8 and D9 Tractors.



MACHINES AND DEVELOPMENTS IN '59!

CAT DW20 and DW21 SERIES G TRACTORS

Now 345 HP for faster cycles—plus new high-capacity LOWBOWL Scrapers for bigger loads!

New horsepower, new rimpull, new speeds, new scraper ratings and new stronger structures—that sums up the impressive list of improvements made in these big new Caterpillar rigs. Compared with the models replaced, the new 345 HP (max. output) four-wheel DW20 and two-wheel DW21 Series G Tractors deliver 12% higher rimpull. This increased rimpull provides up to 20% faster travel speeds under similar haul road conditions. Compared with previous models, the new LOWBOWL Scrapers (No. 456 and No. 470 Series B) have 8% greater capacity. Their new ratings: 19.5 cu. yd. struck; 27 cu. yd. heaped. Also, the new No. 482 Scraper for use with the DW20 has 24 cu. yd. struck capacity, 34 cu. yd. heaped.

To handle this increased HP and increased capacity, both tractors and scrapers have been improved in design and



structure. The tractors, for example, have stronger final drive gears and improved transmission shifter forks. The scrapers have stronger bowls, draft frames and aprons. All these and other improvements result in better service life, less maintenance and cheaper dirt. Geared for today's highly competitive market, these high-capacity rigs meet your needs for moving more dirt at lower cost than ever!



The "ALL NEW" No. 619-No. 442 and the NEW SERIES F DW15-No. 428

Select the tractor-scraper most suitable for your normal working conditions—the two-wheel No. 619 or the four-wheel DW15!

The new No. 619-No. 442 shown here is the first two-wheel rig with advanced design and performance features for any job. Its Turbocharged Cat Engine provides 225 HP and high torque rise, ideal for lugging under load and fast acceleration. Its LOWBOWL Scraper handles 14 cu. yd. struck, 18 cu. yd. heaped. It has a 30.2 MPH operating speed, plus ground-hugging roadability never before found in a two-wheel tractor of comparable size. In every way, it is a versatile "all job" rig.

Design improvements assure greater productivity than

ever in the well-known four-wheel DW15-No. 428. New strength has been added for increased service life in bevel gear and pinion, differential and front wheel spindles. Along with these and other advances, this new Series F unit retains features that made it top performer in its class. It provides 200 HP (max. output) and high torque rise. Its LOWBOWL Scraper handles 13 cu. yd. struck, 18 cu. yd. heaped. The DW15 is also a versatile unit. It can be unhitched from the No. 428 and used to haul other units, among them the Athey PR15 Rear Dump Trailer.



BIG No. 14 TURBOCHARGED MOTOR GRADER

Most versatile BIG grader ever developed for high capacity both on power and control applications!

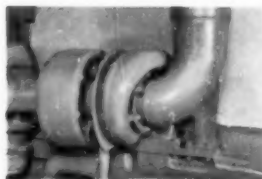
The first and only Turbocharged motor grader, the No. 14 packs 150 HP. Operates at the highest practical working speeds with either a 12' or 14' moldboard. Weighs in the 30,000-lb. class. And with all this power, speed and heft, it has the extra strength to deliver the high availability for which Cat Motor Graders are famous.

Big features include ample throat clearance between moldboard and circle for greater loads; the exclusive Cat-built oil clutch for longer life; the new dry-type air cleaner for greater efficiency; and big 14:00-24 tubeless tires all around.

You can put this versatile unit to work *profitably* on many different applications, such as:

- power applications like heavy grading, heavy ditching, rough grading and bank sloping.
- control applications like light spreading, surface maintenance, fine grading and light blading.

Because of this versatility, you don't have to pick "spots" for it. The No. 14 pays off in a big way on any big job. Name the date—your Caterpillar Dealer will demonstrate!



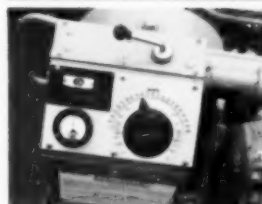
Turbocharged Engine

New 6-cylinder Turbocharged Cat-built Diesel develops 150 HP, with unequalled lugging ability—an 18% torque rise. Only motor grader in its class with "own make" engine. A dry-type air cleaner removes 99.8% of dirt from air during every service hour.



Heavy-Duty Circle & Moldboard

New design provides big load-carrying capacity. Circle and 12' x 27" x 7/8" moldboard are the strongest in the big motor grader class. A 14' moldboard is optional. Exclusive, new Cat mechanical blade controls provide precise, fast blade adjustment and positive hold.



Preco Automatic Blade Control

Optional on the No. 14. Another exclusive for Caterpillar Graders! Operator selects desired slope on dial. Transistorized for freedom from maintenance and adjustment, the unit automatically maintains blade slope within 1/8" in 10'. The Preco control increases operator efficiency on a wide range of applications.

Caterpillar Tractor Co., General Offices, Peoria, Ill.; San Francisco, Calif., U.S.A.

CATERPILLAR

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**DIESEL ENGINES • TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT**

**BORN OF RESEARCH
PROVED IN THE FIELD**



With its adjustable screed, the spreader can strike off at any level—at the full slab thickness of 10 in., or at the 7½-in. height specified for the first lift on the Mengel I-94 job. At right, mixer truck backs in to engage a latch bar on the spreader.

NOVEL SPREADER

(Continued from page 60)

evenly between the forms. A screed strikes off the material at the designated height.

When the truck latches onto the spreader, the truck driver shifts to neutral and the spreader slowly pushes the truck ahead during the discharging operation. A helper is stationed at the side of the truck to open the mixer spout and put the 5 gal. of water into the empty drum.

A 25-kw Onan electric plant and G.E. 10-hp motor controls the spreader's power steering, also drives the hydraulic pump which (1) operates the truck latch, (2) swings the conveyor, (3) raises the screed off the forms and (4) adjusts the screed to the proper strike-off height.

Mengel, armed with the automatic plant and new spreader, is going all-out with ready mix. The company leaders know it will work: in Milwaukee in 1958 the firm paved three miles of 12-ft. pavement in five days as part of a \$1 million contract. And following that shakedown run, Mengel got \$3 million worth of highway paving in Wisconsin for 1959.

The company cites the following reasons for its successful application of ready mix to highway paving:

- A job-site batch plant.

- Regular, uniform cycle of truck delivery.

Better control of concrete.

A means of discharging onto roadbed at a high rate and without segregation.

Smaller equipment units, easier to move.

Though the rate was slowed by the presence of many structures, Mengel averaged about 3,600 ft. of 12-ft. pavement a day on the I-94 job. On a day of normal production, 110 ready-mix truckloads were checked out of the plant in 4 hours. This steady flow of mix is maintained by such devices as fueling the trucks while they are receiving their batches, thus voiding a need for service stops until the day's-end maintenance checkup.

Chief among the advantages that the company claims for its ready mix operation is the control of the mix. Bill Mengel says it beats conventional paving methods because the operators are able to control each load, knowing to the fraction of a gallon how much water is in each truckload. "One mixed load will be more uniform than 4 or 5 individual batches."

Advantages claimed for the spreader:

- Mix is deposited on the base as fast as the truck can discharge it.

- Mix comes out directly from the spout; no chute is needed.

- Segregation is eliminated; the mix drops from the spout to the moving conveyor belt.

When a structure is reached, the spreader — self-propelled — merely drives across.

The boom can be collapsed when the unit is moved, can be readied again for operation in ½ hour.

For long moves the spreader is simply driven up on a low-boy trailer.

The spreader eliminates need for a conventional paver and spreader; the firm's Schield-Bantam truck-crane can handle all equipment moves.

Engineer for the state highway commission was Douglas Small.

Types of Materials Used

Cement: Type IA

Fine Aggregate: Processed bank sand, mixture of dolomitic and igneous grains

Coarse Aggregate: Crushed bank run gravel, 80 percent dolomite, 20 percent igneous

Concrete Mixture

Batches: 6 cu. yd.

Cement Content: 1:35 bbl. per cu. yd. of concrete

Aggregate (dry) per bag of cement: F.A.—244 lb., C.A.—(No. 4—¾ in.)—146 lb., C.A. (¾ in.—1½ in.)—220 lb.

Maximum water: 6 gal. per bag cement

Entrained Air: 4 to 4.5 percent

Slump: 1½ in. to 2½ in.

AASHO Leaders Face New Program Challenges

**Road officials stand ground under
administrative-congressional cross-
fire at Boston convention.**

By Duane L. Cronk

Director, Highway Information Services

Special to Roads and Streets

The annual meeting of the American Association of State Highway Officials in Boston last month was an assembly of men surcharged with many conflicting emotions.

News had just broken that the Eisenhower Administration was planning a complete re-appraisal of the National Highway Program, with an eye to tightening up its fiscal management. And it was quickly followed at the Boston conference by an announcement of the first Administration move—a plan to ration funds to the highway departments to prevent a future run on the nearly depleted Highway Trust Fund.

Under the scheme, Bureau of Public Roads officials warned, the states would be permitted to obligate federal aid only in limited amounts—pre-determined for each state—during each quarter of fiscal 1960. The contract control program, they explained, is necessary to hold obligations of federal aid for construction, right-of-way purchases, and preliminary engineering to a level of \$1.8 billion between last July 1 and next June 30. This in spite of the fact that Congress authorized and the Department of Commerce has apportioned \$2.5 billion for Interstate and ABC projects.

The state men agreed that some

such measure was necessary—if, as the Administration insists, the multi-billion-dollar roadbuilding program is to be maintained as a pay-as-you-go undertaking. But they were understandably dismayed at instructions to check their speed after having finally reached a level of much higher productivity. And they expressed their sentiments bluntly, in both open meetings and private discussions.

In addition, the state highway officials were told, the highway program will be probed on three different directions—the White House, the House Ways and Means Committee, and the House Public Works Committee. The significance of all this attention was not lost on the road men.

The White House wants a fresh look at the Interstate System, particularly the segments in urban areas. These express links are now being designed (by explicit Congressional direction in the Federal Aid Highway Act of 1956) to serve local traffic *equally* with trans-continental traffic. President Eisenhower apparently wants to resurrect the question of federal grants for what might be considered municipal services. (See report on speech by Under Secretary of Commerce

John Allen elsewhere in this issue.)

Congressman John Blatnik, chairman of one of the Congressional committees, told the assembly he is going to investigate charges of over-design, waste, collusion and other offenses in the highway program. (The other committee will concern itself with financing inconsistencies raised during the last session.)

Between the threat of these probes and the Administration's decision to re-survey the road program from a critical position, the highway officials were understandably disgruntled. When Congressman Gordon Scherer of Ohio stood up in a general session and unwound with a series of blasts against probes, "hatchet men" and other do-no-gooders, the audience gave him a standing ovation.

Congressman Scherer, who was one of the most inquisitive interrogators of witnesses during highway hearings last session, admitted that "political headline hunters" would undoubtedly find minor cases of mismanagement. Such incidents would be publicized all out of proportion. But, he declared, graft, inefficiency and waste have been kept to a minimum, considering the gigantic size of the program. The BPR and the states have done "an excellent job," he said.



President-elect of AASHO for 1960: David H. Stevens, chairman, Maine state highway commission (left). He succeeds R. R. Bartelsmeyer (right) of Illinois. Elected first vice-president was D. H. Bray, Kentucky state highway engineer; also regional vice-presidents: O. H. Fritzsche (New Jersey), Joe Grotegut (Florida), R. E. Bradley (North Dakota), W. C. Williams (Oregon). Treasurer: E. L. Roettiger, Wisconsin.

Municipal interests fought back, too, against the White House suggestion that urban links of the Interstate net might be shaken out of the program. Ben West, mayor of Nashville, Tennessee, and former chairman of the National Committee on Urban Transportation, forcibly reminded the Administration that the Interstate System was sold as a complete package to Congress and to the American people, with specific provision for urban segments. The Clay Committee, he said, had recommended that "the federal government assume primary responsibility for the Interstate network . . . to include the most essential urban arterial connections," and that in no other section is there the clear and urgent need felt in metropolitan areas.

"I simply cannot understand . . . a policy of bypassing cities, to treat them as beggars at the back door, so to speak," he declared. "How can such a policy ever be justified when cities pay nearly half of all the revenues in the Highway Trust Fund and constitute the living, working, and recreational areas of two-thirds of the American people."

As for charges of waste, Mr. West pointed out, there should be a clear appreciation of the difference between "waste" and "cost." It is true that in the urban areas the highest

costs are encountered, but the BPR and the state highway departments "would never be party" to waste.

"In fact, my experience with both has indicated a definite leaning, at both levels, to almost downright stinginess."

"We have not only a breath-taking opportunity through the National Highway Program to relieve the crisis of urban congestion, but also an instrument to solve many of the other accumulating, urgent problems of our cities," he said. "This is the greatest significance of the federal-aid highway act."

"To keep the Interstate System out of cities and urban areas would be a terrible and tragic mistake. The result would be deliberate, calculated national suicide in the form of slow strangulation by traffic. Since it would also be a tax inequity of the worst possible sort, the cities of this nation will fight any such proposal to its ultimate conclusion."

Strengthened in their convictions by these indications of support, the highway engineers officially went on record urging that urban sections of the Interstate System "be constructed as planned" in the Act of 1956, that design standards of the network not be sacrificed in the interest of economy, and that

the contract controls scheme be scrapped.

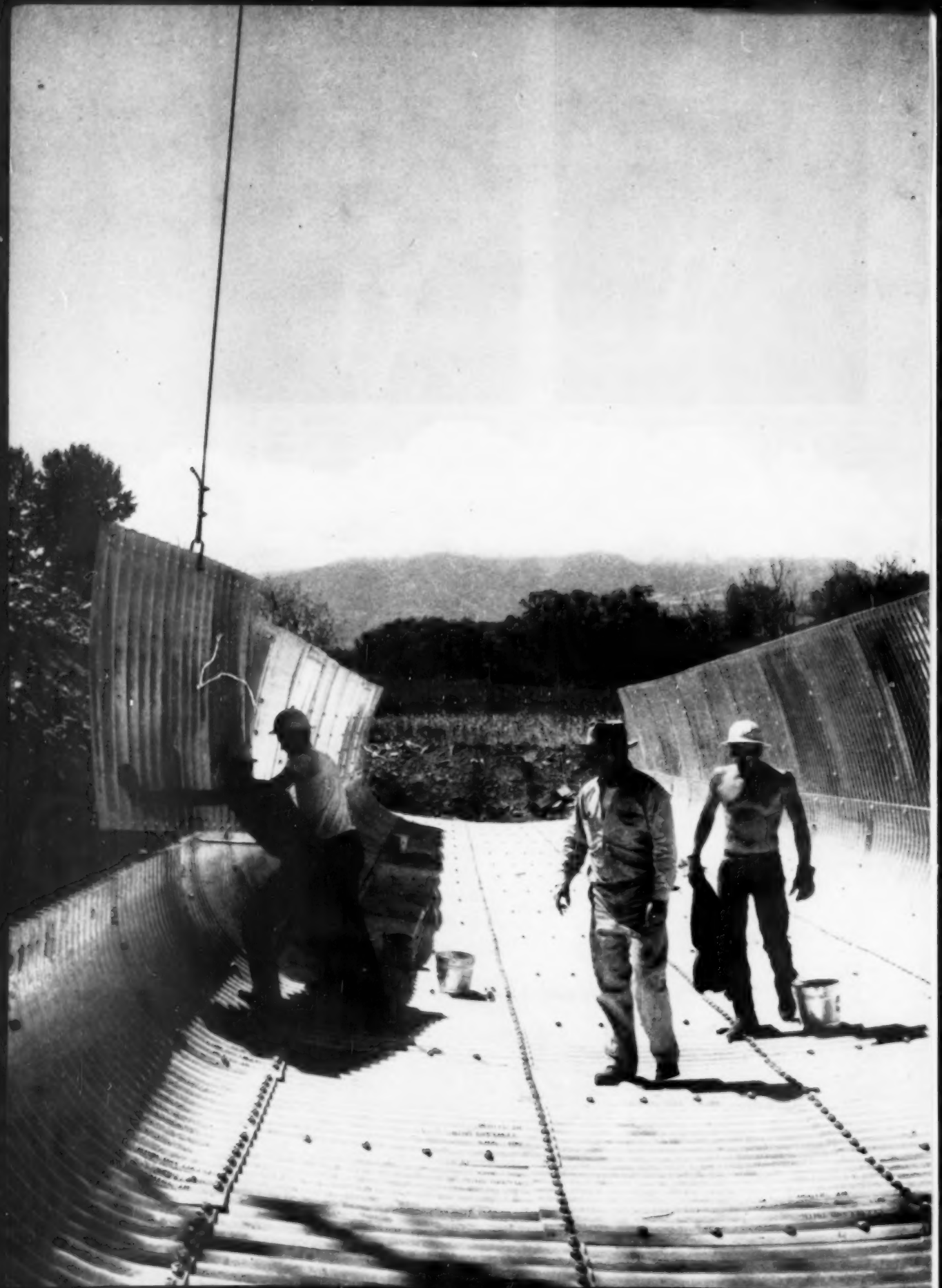
Alf Johnson Honored

Alfred E. Johnson, AASHO's executive secretary, was honored with the Thomas H. MacDonald award, presented annually by the American Association of State Highway Officials.

The award goes each year to the employee or former employee of a state highway department or the U.S. Bureau of Public Roads who has made an outstanding contribution to highway engineering and to the highway program. Rex M. Whitton, chief engineer, Missouri state highway department, made the presentation at Boston.

Johnson, former chief engineer, Arkansas state highway department, has headed AASHO in Washington for the past five years, and was president of AASHO.

MacDonald, for whom the award is named, was former chief of the Bureau of Public Roads for 34 years. His vision and foresight in highway planning, design and formulating of policies are credited as having largely made possible our highway system and the unique federal-state partnership and continued Congressional support of highway development.



Biggest Corrugated Underpasses?

Getting heavy machinery, vehicles and livestock safely across a main highway can become a deadly game in the western cattle country.

The Montana state highway department engineers faced this problem along a newly-built, heavily-traveled 7.7-mile stretch of Interstate Route 90, Park County. They solved it by providing seven separate underpasses of sectional plate construction—two for farm machinery and trucks, and five for livestock.

The series of underpasses includes two of the largest structures ever produced by Republic Steel's Culvert Division. Both are vehicle underpasses having a span of 16' 5 $\frac{1}{16}$ " and a rise of 14' 2 $\frac{13}{16}$ ". Lengths are 116 and 120 ft. The corrugated plate structures support maximum legal load limits on overhead roadways.

Vehicle underpasses are paved with asphaltic mix for smooth traveling with rubber-tired or crawler-type equipment. Pavement is 10 ft. wide, with 6 in. depth of surfacing material at the centerline. To reach the underpasses from the main highway, trucks, tractors and farm implements will use surfaced right and left turn approaches. Approaches average 100 ft. long and 24 ft. wide.

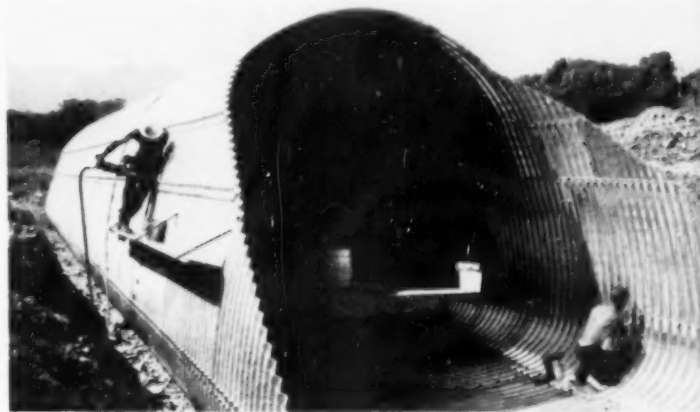
Livestock underpasses are designed to permit animals to use grazing land on either side of the busy highway without having to cross in the face of traffic. The longest livestock passage is 164 ft. with a diameter of 60 in. Second, third and fourth stations are 92, 98 and 100 ft. in length. Span and rise for all three is 14' 3" and 8' 11", respectively. The smallest structure is 82 ft. long, with an 8' 10" span and 6' 1" rise.

Continued on page 103

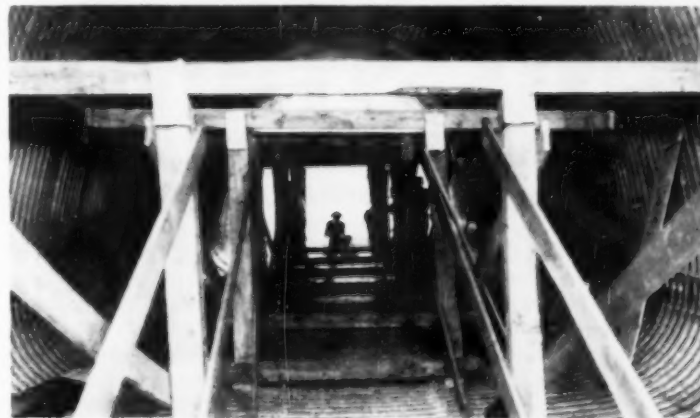
Republic Steel sectional plate is swung into place for 120-foot-long machinery and truck pass, Park County, Montana. This unit has a span of 16 ft. 5 $\frac{1}{16}$ in. and a rise of 14 ft. 2 $\frac{13}{16}$ in.



Panoramic view of Montana farm and ranchland shows Interstate Route 90 and sectional plate underpass for farmers machinery and trucks. Photo taken before completion, shows ramps and approaches to underpass.



Workman at right using hand tool for preliminary tightening, worker on scaffold follows-up with pneumatic wrench.



Hardwood uprights, stringers and struts in place prior to backfilling of big pipe. Backfilling carefully performed in layers.



NO STAND-BY HERE!

**Men, machines and materials aren't held up because
INTERNATIONAL 230 Series Trucks are built to hold up!**

WATCH 'EM WORK! Frame side rails on INTERNATIONAL 230 models are double channel and heat-treated — offer a combined section modulus of 24.74. Engineered with extra heavy-duty cross-members, they take the twisting torture of potholes and gullies under maximum payloads... and come back for more.

SEE 'EM DRIVE! Proven "six" and V-8 gas or in-line diesel engines produce full-muscled power with up to 695 lb.-ft. of torque. Power-matched four, five or 10-speed transmissions with three or four-speed auxiliaries are all-weather conditioned to pull ahead over all ground and grade conditions.

LOOK 'EM OVER! They've got extra-rugged design from channel-iron bumper and diamondette steel fenders to husky reinforced rear cross-member. You get longer life with little maintenance in your choice of off-highway four- and six-wheel models that mean more work for less money!



Try 'em for all they're worth!

Get complete details on a demonstration of an **INTERNATIONAL 230 Series** model at work on your job. See your **INTERNATIONAL Dealer** or Branch now!

When only a six-wheeler can do the job right, only **INTERNATIONAL** offers 84 ways to go.

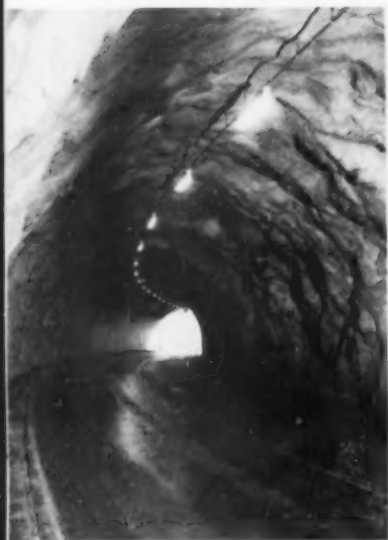
... for more details circle 311 on enclosed return postal card

INTERNATIONAL[®] TRUCKS

WORLD'S MOST
COMPLETE LINE



International Harvester Company, Chicago
Motor Trucks • Crawler Tractors • Construction Equipment • McCormick® Farm Equipment and Farmall® Tractors



Daytime photograph shows lighting details and uniform effectiveness.

East tunnel portal seen on a rainy night. Note the approach grade, the rather sharp curve required in the tunnel for this difficult location and effectiveness of portal and tunnel lighting.



Experimental Tunnel Lighting

The Colorado department of highways chose Tunnel 6 on US 6 west of Denver for a laboratory lighting installation. The effect will be evaluated as a safety aid.

Installed were six 15,000 lumen mercury vapor lights, thirty 9,300 lumen fluorescents and one 72-in. fluorescent. Under a contract with the Public Service Co. of Colorado, the total cost was \$11,367, borne chiefly by this utility which has a 10-year maintenance and operating contract.

District engineer George N. Miles explained that there will be less illumination in the tunnel at night than in daytime, to balance with sunlight outside. Motorists reaction to date has been highly favorable.

End-Result Grading Specifications

**How they are working out
in four western states.**

By H. K. Glidden

Contributing Editor to Roads and Streets

Part 1 of a special two-part field report on results type specifications for earth compaction in Colorado, Wyoming, Idaho and Washington.

End-result specifications, as recently inaugurated to varying degrees by the western states of Colorado, Wyoming, Idaho and Washington, mark the advent of a new engineering concept of getting the most for the tax dollar. These specifications judge the contractor's performance, insofar as existing test procedure will permit, on the basis of the quality of the end product. Their use permits the contractor wide latitude in the choice of equipment and construction methods. This concept is in sharp contrast with "methods" specifications which detail results, while at the same time exercising strict control over many phases of the contractor's activities.

At least six factors appear to have worked in favor of the decision to adopt end-result specifications: work-volume pressure brought on by the Interstate program, concurrent with an engineer shortage; new and better equipment; new and faster test devices; constant upgrading of contractor personnel; growth of responsible contractor organizations; and many engineers taking a more realistic look at the factors which actually govern quality of results.

Then there are the long-acknowledged weaknesses of the "methods" specification. These factors together have allowed the engineer recently to explore the potential benefits which can result from allowing the talents, experience and ingenuity of equipment makers, material producers, scientists, and contractors to aid him in the wise spending of public money.

The purpose of this report is to determine whether or not end-result specifications have so far proved to be beneficial; how and to whom do benefits accrue? It will attempt to evaluate the effect of end-results on quality of work, bid prices, use



Nobody told the contractor how to roll here. The effectiveness of vibratory rolling on this particular job is illustrated by the obliteration of scraper tire marks. Both units are OHg1 Vibro Plus, one pulled by Fordson tractor, other by Cat D4. Sheepfoot work in conjunction.

of engineering personnel, test procedures and construction practices.

Data from which to state conclusions were gathered during travels over a three-month period. We observed and discussed end-results directly with contractors and engineers in Colorado, Wyoming and Idaho. Washington's experiences were reviewed by indirect means.

The extent to which end-result specifications are being applied varies considerably among these four states. Colorado and Wyoming have gone so far as to include embankments, foundation courses, bituminous wearing surfaces, and to some degree, such items as concrete pavement, structural concrete and control of traffic during construction. All four states are completely

on end-results in their embankment specifications. This report will be limited to embankments.

Briefly stated, the conclusions reached are:

1. Engineers, contractors, equipment manufacturers, material producers—and the taxpayer—all share in benefits. The benefits are both financial and psychological; they have many of the same aspects which accrue from our system of free enterprise. The net result—bid prices and engineering costs should go down gradually in relation to the general price trends.

2. The quality of the work observed was realistically good and usually accomplished with a minimum of wasted effort. Contractor personnel appeared to be taking far

greater interest in securing quality results.

3. Engineering personnel are relieved of a vast amount of monotonous bookkeeping and in general have appeared happy to relinquish their previous supervisory responsibilities concerning the contractor's use of methods and equipment.

4. Testing equipment and methods are the bottleneck to expanded usage. Results must be known almost immediately. While existing test procedures have proved adequate so far, more reliable and faster test methods are needed. The engineer will have to be prepared to defend his interpretation of results before a court of law whenever the stakes are high enough.

5. Construction practices have

not changed radically. Contractors are now judging each piece of equipment more on the basis of its ability to do the job than previously. Supervisory personnel are taking prideful advantage of their opportunity to demonstrate their construction know-how.

6. An out-on-a-limb prediction: end-result specifications will supersede "methods" for embankments and general grading, as rapidly as test procedure development will permit.

The Problem. While embankments come in several categories—earth, granular, rock, etc.—the practical field task in placing any materials in a fill to provide a stable subgrade is the same in all cases: uniform densification by compaction.

Several methods have come into use for determining the maximum density to which a material can or should be compacted. Each of these methods takes into account the fact that there is an optimum moisture content at which maximum densification can be achieved with least expenditure of work. Each takes into account the fact that the compacting force dissipates with the increased depth of the layer to be compacted. The principal factors in obtaining densification are optimum moisture content, compactive effort and layer depth.

The "methods" specification approach is to spell out in detail both the methods and equipment to be used by the contractor in controlling each of these factors. These specifications also clearly state the results to be achieved. This incongruous situation is largely responsible for much of the engineer's bookkeeping and construction supervision. Roller time has to be counted and reported in either hours or the number of passes over a particular spot. The contractor frequently has to be directed where and when to roll. The depth of layers of fill must be inspected frequently. The book is followed as religiously as available personnel will permit.

Whether or not the specified methods and equipment are efficiently effective depends largely upon the accuracy and scope of pre-contract sampling and testing. Poor

preliminary testing can result in inefficient rolling; or, conversely unnecessary rolling after required compacting has been achieved. Tests indicating insufficient densification usually result in more of the same type of compactive effort at an extra cost to the state.

The end-result approach is to specify the minimum degree of densification only and usually involves two or three bid items. As an example, Wyoming with its generally arid climate has a basic price for moving the material; water is paid for, and there is a price for compaction per cu. yd. Except for layer requirements, methods and equipment are left largely up to the contractor. The work is accepted or rejected solely on the basis of density test results. However, care is taken to prohibit or control obviously unsound construction practices.

Colorado Specifications. It is realized that taking material out of context is subject to misinterpretation. Pertinent clauses are quoted at random from the Colorado department of highway's "Standard Specification for Road and Bridge Construction" approved January 1, 1958. These are given in exact phraseology because of the importance of what precisely is said or unsaid.

Item 15.1.10. Embankments being placed with truck type hauling equipment shall be constructed in layers by dumping each load of material on the layer being constructed and blading the material into position with bulldozers or similar equipment to produce a fill of uniform density.

Item 15.1.11. Embankments built of earthy material or gravel or small pieces of rock or material by volume less than 25 percent rock larger than 6 inches in greater dimension, shall be constructed in layers not exceeding 8 inches before compaction. Embankment material containing by volume 25 percent or more of rock too large to be compacted in 8-inch layers shall be spread in layer thickness not exceeding the maximum rock size. Sufficient earth or other fine material from the excavations shall be incorporated with the coarse rock as deposited, to fill the interstices insofar as possible and to provide

a dense, solid embankment.

Item 15.1.12. Frozen materials shall not be used in construction of embankments.

Item 15.2.1. In general, embankments shall be placed and compacted in layers as provided in par. 15.1.11, with the exception that side hill fills where width is too narrow to accommodate compacting equipment, or fills across precipitous areas not accessible to compacting equipment, may be placed by end dumping until the width and height of embankment will permit the use of compacting equipment, after which the remainder of the embankment shall then be placed in layers and compacted as specified.

Item 15.2.3. To facilitate the compaction of embankments, each layer of embankment material shall be placed uniformly across the entire width of the fill. Care shall be taken to distribute the movement of all grading equipment over each layer so that uniform compaction is facilitated. Successive layers shall not be placed until the previous layer has been properly compacted. Where the use and distribution of grading equipment does not result in satisfactory density of embankments, wetting and compaction of the embankments will be required and paid for (in conformity with Item 17).

Item 17.2.1. In general, all embankments, the bases of cuts and the original ground underlying embankments shall be wetted and compacted to secure a Roadbed meeting the requirements of these Specifications for density and moisture content.

Item 17.2.2.1. The base of cuts, natural foundations underlying embankments, and all embankments except those composed essentially of rock shall be wetted and compacted to obtain the specified density At all other places and under all other conditions, scarifying, wetting, and compacting of foundation materials shall continue until a minimum field density of 90 percent is obtained for all soils except those of the A-1 and A-3 (HRB) classification. For the A-1 and A-3 soils, a minimum density of 95 percent shall be obtained.

Item 17.2.2.2. Field density tests will be made concurrently with the



Making a density test on a recent Idaho project. Faster tests, quicker reports to the contractor, a problem only partly solved.



Inside one of the testing lab-on-wheels which is helping give quicker results decisions to the contractor.



Outside one of the Idaho field materials testing lab-on-wheels.

Idaho's Quick Verdict Test Lab

placement of all materials requiring wetting and compaction. All such tests will be performed by Inspectors assigned by the Department. The field density of materials, in place after compaction, will be determined in accordance with AASHTO Method T-147, or other approved practical compaction tests.

Item 17.2.3.1. Wetting Embank-

ments, bases of cuts and subgrade shall be done with sprinkling equipment of a type which insures uniform and controlled water distribution. Material from cuts or borrow pits may be wetted at the source. The Contractor must furnish sufficient water equipment to insure proper moisture content of all materials being placed as required by Plans or directed by the

Engineer. All wetting shall be done by uniformly sprinkling each layer or course of material being placed, except as otherwise permitted herein. Water used shall be sufficient to obtain maximum density of the material.

Quantity of water to be used in embankment construction shall be

Continued on page 130

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To give cost-cutting insurance ideas to business and industrial editors for their readers, American Mutual specialists recently held a round-table session with McGraw-Hill publications.

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You get more than just a full power-shift transmission with the TL-14 TRACTO-LOADER. You get a transmission that is controlled by ONE LEVER — not two or more levers or a combination of levers and foot pedals.

This means no stopping to shift to get into a higher gear. You go into and out of any forward or reverse gear "on-the-go"—from low to second or high instantly, while moving.

And you get a power-shift transmission

that is equipped with a torque converter with a big 3.5-to-1 ratio of torque increase at full stall — more than any other loader its size. Means you get the job done — faster, easier — in toughest going.

If you are after all-out production at the pile, if your hauls are long . . . if loading work is scattered and you want to go from one job to another in a hurry — then the TL-14 with a full power-shift transmission can't be beat. A demonstration will convince you.



The TL-14 has MORE of everything! More Reach — dumps right into center of high body trucks. More Carry Capacity — 5,300 lb. More Breakout Force — 18,800 lb. More Power — 86 hp gasoline, 83 hp diesel. And there's a family of six buckets to choose from — 1 to 3 cu yd.

for a wheel loader

For All-Out Savings...

TL-14 with TRACTOMATIC TRANSMISSION

simple design • economical • power-operated

Now you can get a transmission that gives you the ease of operation you want at big savings. The optional TRACTOMATIC transmission for the TL-14 TRACTOLOADER is hydraulically operated and simple in design.

Because there are fewer parts and gears and only two clutches (easy to get at), the price and maintenance of the TRACTOMATIC is considerably less than a full power-shift transmission. This means a lower first cost for the TL-14 . . . lower upkeep, easier servicing throughout its life.

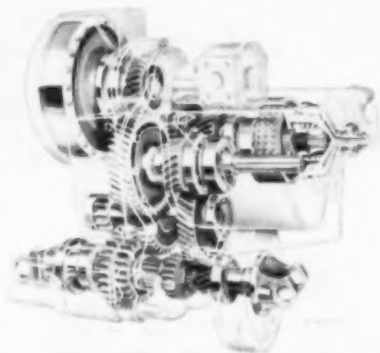
Extensive field tests prove that the TL-14 with a TRACTOMATIC transmission will perform as well or better than other loaders with full power-shift transmissions on short-haul loading and stockpiling.

If you want a good, reliable, easy-operating loader, you can really save money by choosing the TRACTOMATIC transmission for your TL-14. Ask your Allis-Chalmers dealer to show you what it can do. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wis.

FAST, EASY SHIFT — Operator just flips a lever on the steering column to go forward or reverse. Since the reverse speeds are 30 percent faster than forward, you get the extra back-away speed you want without shifting into a higher gear. To get this higher reverse on most other loaders, two separate levers would have to be moved.



HYDRAULICALLY OPERATED — Note the simple, compact design of the TRACTOMATIC transmission in this cutaway. Two multiple-disc clutches — just outside the transmission — are hydraulically actuated and share the work load. One is for forward, the other reverse. As one works, the other rests and cools — an important contribution to long clutch life. Both are accessible for quick adjustment.



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ROADS AND STREETS, December, 1959



Applying slurry for subgrade treatment, Interstate Highway 10 in Chambers County.

Lime Slurry Upgrades Poor Subgrade Soils

Barges each carrying 200,000 gallons of lime slurry (calcium hydroxide) have in recent months dotted the Intracoastal Canal along the Texas coast. The white stuff is supplied for highway use by Dow Chemical Company from its Freeport, Texas, plant.

By early next year 19 loads are expected to be delivered in what are believed to be the first barge shipments of lime slurry in the United States. The slurry will help stabilize roadbeds having high clay content along an 18-mile segment

of Interstate 10 between Houston and Port Arthur.

Lime for this road job was produced from oyster shells dredged from Galveston Bay. Calcining, slaking and dewatering produced a slurry containing a minimum of 31 percent solids consisting of 95 percent $\text{Ca}(\text{OH})_2$. This slurry was pumped aboard barges and moved to Wallisville, where it was transferred by pump directly to the tank trucks which served as reservoirs for the spreaders.

No agitation was required in the

tank truck during the haul of approximately six miles to the job site. A system of air agitation kept the lime in suspension in the barge tanks.

Shipping and handling of lime are said to afford a saving to taxpayers, since it is not necessary for a road contractor to operate a mill on the job site to convert dry lime into slurry. Thus equipment for converting, such as two dry lime storage tanks, a weigh-hopper, a mixing tank, an 8,000-gal. slurry storage tank and various convey-



Lime slurry is pumped into tank from barge, for 5-mile haul to job site.

ors, pumps and piping have been eliminated in the Texas project.

W. D. Syphrett, resident engineer out of Texas highway department district 20 estimated savings in this manner: "The purchase of slurry rather than dry lime resulted in a reduction in cost from \$30 a ton to \$28.45 a ton of $\text{Ca}(\text{OH})_2$ on this job." The total savings are expected to be \$3.00 to \$4.00 per ton.

Calcium hydroxide can be and is sometimes applied dry. However, the highway department specified

slurry because it has afforded better distribution of lime and prevented waste caused by the wind. Wind-blown lime also has created a nuisance potentially damaging to crops, property and livestock.

Lime has found use for road stabilization because it reacts pozzolanically with clay particles, cementing or binding the soil mixture into a much stronger and more stable base than the untreated material. It breaks down the ability of the soil to hold water, producing a very friable material which

can be mixed and bladed with relative ease. The result is a function that is particularly economical in highly plastic soils.

The first step in this highway building project was to disc the subgrade and add fill. Then the bed was shaped to section and disced to a 9-in. depth before the first of two lime applications. Mixing of the soil with a mechanical mixer is sandwiched between the lime applications. After the second lime treatment, a five-day "curing" period is required before further



Discs mix calcium hydroxide with soil. Two applications of lime slurry get the job done.

construction steps are undertaken on the road.

The Austin Road Company used Seaman-Andwall and Bros mechanical mixers for discing and mixing. The lime slurry was put down with a pressure spreader designed and built by Austin. It consists of a 4-in. pump and a 3-in. spray bar mounted on a truck which attaches to and pushes the tank truck holding about 3,500 gal. of lime slurry. The spray bar can dispatch slurry

over a width of 12'9".

After the slurry applications, the roadbed is pulverized and compacted. Light asphalt is added at 0.2 gal. per sq. yd., followed by placement of 4½ in. depth of sand-shell admix, 12 in. of shell concrete, and 1 in. of hot mix.

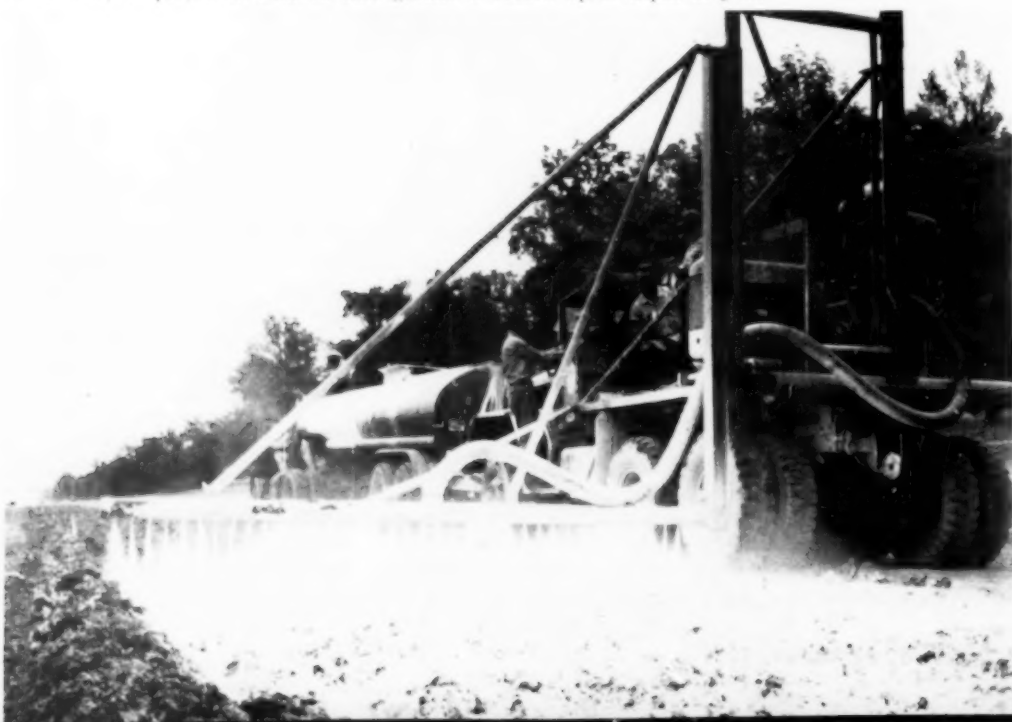
Lime requirements for the Houston to Port Arthur road were based on 3½ percent of weight of soil. It was determined that 28.35 lb. of calcium hydroxide per sq. yd. of

roadbed were needed for effective stabilization.

According to Fred Dodge, senior resident engineer, and R. M. Stephenson, resident engineer, the use of lime slurry on this job upgraded Class A-5 soil to Class A-3, and Class A-3 soil to Class A-2.

Interstate Highway 10 is one of the largest highway jobs for the Gulf Coast area. It will be the new route for State Highway 73 from Houston to Port Arthur.

Lime slurry is sprayed on roadbed after ground is broken up to depth of 9 in.



Mechanic in foreground sharpened 2 3/4 in. bits using special carborundum balanced grinding wheels. Far mechanic used Bitco wheels and Bitco shank sizing attachment for smaller bits.



Hard Rock Bits Sharpened on the Job

Contractor H.E. Lowdermilk's tough rock job on Interstate 40 and 6 in the canyon west of Denver (detailed in October Roads and Streets) was expedited by sharpening bits on the project. Four drill rigs and several hand-operated drills called for an ever ready supply of the Timken carbide insert rock bits used. The track drills used 2 3/4-in. bits, the other drills smaller sizes.

The contractor set up two 1/2-hp electric bench grinders in connection with a trailer-housed shop for bit sharpening. One grinder was exclusively for large bits, the other for smaller bits. All bits were hand held during the sharpening except for shank sizing. The wheels were continually checked for cutting

edge contour by use of metal patterns and dressing tools.

The smaller bits were sharpened on Bitco 8X1X1 L-10-e and 8X3/4X5/8 L-11-e grinding wheels. This grinder was equipped with a Bitco sizing attachment for sizing the diameter of the drill shank. It took approximately 10 minutes to sharpen a small (1 3/4-in.) bit.

The 2 3/4-in. bits were sharpened on special carborundum grinding wheels. Most used was the G060-H11-VR 8X1 1/2X1 balanced wheel. Sharpening these bits took somewhat more than 10 minutes. It was not found to be necessary to size the shank of the 2 3/4 in. bits.



Extreme accuracy of grade, better control of concrete yield, and saving of machine and labor cost, were dividends with Blaw-Knox precision subgrader with deep-cut attachment.

Deep Accurate Subgrader Saves at Selfridge Field

The ability of one machine, instead of the usual two, to provide precise subgrade at 21-in. depths proved a considerable boon to Western Contracting Corporation operations on a mammoth concrete paving project at Selfridge Air Force Base in Mount Clemens, Michigan.

The machine, a subgrader, with a new, exclusive deep-cut attachment developed by Blaw-Knox Company, gave the Sioux City, Iowa, contractor a much greater accuracy of grade than was possible when employing the commonly used trail blade method.

"In addition," James Clark, fine grade foreman for Western, said, "we were able to release two machines used in the trail-blade method—a scraper and grader—and a laborer for other work."

Actually, the precision subgrader's new deep-cut attachment did the job with room to spare since it's capable of 24-in. deep operation.

The unit's vibrating cutters were

able to break up harder material. Perforated cutter scoops, with double edge reversible cutter blades, sheared off embedded stones and permitted fine dirt to sift through small holes, providing fines for making the smooth surface required for finished subgrade.

Prior to introduction of the subgrader deep-cut attachment, Western Contracting used the tractor-pulled trail blade for grading below 12 inches. After a pass with this unit a scraper moved in to handle surplus dirt. This system required at least three passes with the trail blade and scraper.

The subgrader and its deep-cut attachment were used on the Selfridge AFB project after base was leveled to within 2 in. of final grade. In preparing a 16-in. deep operational apron base for concreting, the deep-cutting subgrader leveled the course from 1 down to 15 7/8 in. One-eighth inch was allowed for roller compaction.

As a result of this precision subgrading, foreman Clark said Western Contracting achieved a better control of yield in meeting concrete thickness requirements.

\$200 Million Bond Plan for R.I.

A \$200 million road construction plan including a Providence thruway and a circumferential route around the city was recommended by Arthur D. Little, Inc., Cambridge research firm, as the best and quickest way of speeding industrial development in Rhode Island.

Under the program, the state would accelerate highway building by investing an extra \$80 million in road construction in the next five years beyond what normally would be spent under the regular pace of the federal-state program.



LATEX



BEFORE—Heavy traffic and freeze-thaw conditions eroded concrete on a Michigan bridge leaving a very poor road surface.



AFTER—Two years and 200 freeze-thaw cycles after a ½" resurfacing with latex-modified portland cement. Road shows little sign of wear.

Now . . . cut preparation time and expense with latex-modified portland cement patching

Here's how you can patch concrete roads, bridges, and get far greater savings in preparation cost and greater durability, too—than ever was possible with conventional asphalt or concrete patching!

There's no need to remove or replace large volumes of concrete when you patch with Dow latex-modified portland cement. That's because the patches require a minimum depth of only ½"—instead of the 2" to 4" depth required with conventional patching materials. This means no extensive jack-hammer jobs—a big saving in time and labor. The road surface is back in service in only a fraction of the time usually required for conventional patching.

Portland cement modified with Dow Latex shows remarkable durability, too. Recent tests on a Michigan bridge, for example, shows no spalling . . . no pitting . . . practically no wear after two years of heavy traffic and approximately 200 freeze-thaw cycles!

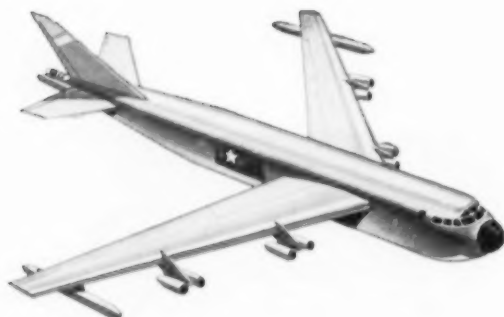
What's more, latex-modified portland cement exhibits low water absorption, greater flexibility, higher tensile, compressive, and bond strengths, and has an expansion-contraction rate similar to concrete thus reducing stresses on the patch.

Write for more information today. **THE DOW CHEMICAL COMPANY**, Midland, Michigan, Plastics Sales Department 2340EK12.

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

ROADS AND STREETS, December, 1959

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At Kinross Air Force Base ... helps the

THE "JET AGE" IS HERE. And with it is the problem of rebuilding airports to provide the longer, stronger, heavier runways these big jets need. That's why airport builders and designers are planning thicker, stronger airfield pavements with extra-heavy reinforcement . . . pavements that will match or exceed present jet requirements. And that's why the heaviest welded wire fabric ever produced was installed at the vital Kinross Air Force Base in Michigan.

Operational jets in commercial service now impose gear loadings in the neighborhood of 130,000 lbs., with gross weights of 295,000 lbs. Future models may go even higher. For that reason, only reinforced concrete provides the added strength to meet the unusually heavy and severe requirements of the "jet age." Specify USS American Welded Wire Fabric for reinforcing all runways, high speed turnoffs, taxiways, and service pads . . . get these important advantages:

- USS American Welded Wire Fabric distributes heavy wheel loadings over a larger area to prevent harmful overloads at any one point. Impact, shock, suddenly applied or released loads such as occur during landings and take-offs are more uniformly "absorbed" by each slab. Reinforced concrete slabs are 30% stronger than unreinforced slabs of equal thickness.

- USS American Welded Wire Fabric prevents harmful cracking from developing because of its uniformly spaced high-tensile-strength welded steel wire construction. Its action "knits" a slab together.

- USS American Welded Wire Fabric unifies the action of any slab when it expands and contracts due to temperature change.

- Longer, wider slabs can be laid when USS American Welded Wire Fabric is used. This means fewer joints, fewer load transfer assemblies. The reduction in the number of joints not only means economy, but also a smoother, safer landing surface.

- When existing airfield pavements must be strengthened, USS American Welded Wire Fabric reinforced concrete overlays will produce unbroken grade lines and provide additional strength. Thus, maximum economy is achieved.

Specify USS American Welded Wire Fabric. It's available in a wide variety of styles, lengths, and widths . . . in wire sizes from $\frac{1}{2}$ " diameter to 16 ga. and in longitudinal or transverse wire intervals of 2" to 16". The engineers at American Steel & Wire will be glad to tell you more about the application possibilities of fabric and how it can serve your needs. Get in touch with American Steel & Wire, Dept. 9264, 614 Superior Avenue, N.W., Cleveland 13, Ohio.

USS and American are registered trademarks

Contractor: Loselle Construction, Inc., Wyandotte, Michigan

Paving Material Supplier: Scioto Supply Company, Lansing, Michigan

Design and Supervision: Corps of Engineers, U. S. Army



**American Steel & Wire
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United States Steel**

Columbia-Genesee Steel Division, San Francisco, Pacific Coast Distributors
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United States Steel Export Company, Distributors Abroad

At Kinross Air Force Base, workmen are installing a section of USS American Welded Wire Fabric—Style 55-7-07-0 (7-0 Gauge is 0.490" Diameter Wires). USS American Welded Wire Fabric is entirely fabricated by electrically welding all intersections of the high strength steel wires. This insures positive placement of the steel in the slab and eliminates costly field tying and extra handling.



World's heaviest Welded Wire Fabric big jets land safely!



**+ VALUE
CONCRETE**

Under the direction of the U. S. Corps of Engineers, another new United States Air Force Base is made ready to join our air defense network. It is Kinross, located on the Upper Peninsula of Michigan. This base was expanded to handle bigger, heavier modern jet aircraft. USS American Welded Wire Fabric was used in the rigid overlays on the strengthened and lengthened runways.

USS American Welded Wire Fabric

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ROADS AND STREETS, December, 1959

As erection progresses toward island, new falsework bents are placed in the shallow 30-mph torrent. Good view of rope safety net with 50-ft. spreader beam.

How Bridge Crew Spanned Niagara Rapids

**Arched main span of new bridge
is Western Hemisphere's longest
continuous steel girder span.**

Difficult foundation work and all-out safety measures for workers marked the erection of a new bridge above scenic Niagara Falls.

Tourists will cross the new 590-ft. continuous steel girder structure to get to the falls famed vantage point, Goat Island. The American Rapids Bridge is part of the New York State Power Authority's park and parkway system along the U.S. side of the Niagara River in the falls area.

The bridge has a 24-ft. two-lane roadway and sidewalks. In profile it has the appearance of a shallow arch. The designers and engineers, Praeger-Kavanagh, of New York City provided grace and symmetry by leaving the steel girders exposed. The girders rise from 16 ft. depth at bearing ends to 7 ft. midpoint. The 2,200-ton job was fabricated and erected by Bethlehem Steel Company.

It was the rushing, rumbling waters of the river, with an estimated velocity ranging from 12 to 30 knots, which gave erection crews some of their biggest headaches. Should anyone tumble into the rapids at this point, he would be helplessly carried over Niagara Falls moments later. To protect the erection crew, Bethlehem strung a large rope safety net under the over-water erection area. The net was held in place by two lines of 1-in. wire rope running across the river. Steel spreader beams 50 ft. long were used to spread the net, which incidentally furnished bridgemen with access to false-

work bents placed in the water forward of erection.

Through such precautions the erection work was completed with an excellent safety record.

The great water pressure also hindered the driving of 28-ft. rock-pointed piles, 14WF87, for the bents. Each of the two cages of a bent contained 10 piles, making a total of 20 piles per bent. River bottom is composed of "soft" rock which admitted the hammer-driven piles to about 1 ft. average penetration.

The cage began with a basic structure of four corner piles and horizontal and diagonal bracing fabricated on land. River bottom elevation was so uneven, due to natural erosion of the rock, that the setting of the cage and the driving of additional piles in it constituted the major problem of the contract. For example, a hole 4 ft. deep turned up under one leg of a cage.

One bent-steadying device was a tie-back wire rope anchored to a hoisting engine 400 ft. upstream. Fastened to the bent at water surface, the tie-back helped counteract the river velocity.

Once the piles were driven, 27WF145 header beams were set east-west across each cage between the sets of piles. North-south across the header tops were placed two 16-ft. 14WF320 distribution beams per cage. Over these beams, east-west across the cages, were two main 40-ft. header beams, 36WF300.

Heavy blocking beams and shims on top of the





Importance of accurately placed falsework bent is illustrated in this view of girder being set over water.



Landing on the island side. Lower half of a girder, 91 ft. long, is being set by Bethlehem bridgemen.

main headers brought the falsework to a precise final elevation besides providing jacking room. Each girder (three lines of them) was adjusted to elevation with a 500-ton hydraulic jack and the girder was then shimmed to this elevation.

A maximum of two bents were in use at one time. Bents were placed at four locations in cantilevering the span from riverbank to Goat Island. Thus a bent no longer in use was pulled up and re-erected in a forward position. No erection was carried on from the island, since the weight of the girders outstripped the load capacity of the old adjacent existing bridge.

Due to the difficult river conditions, the accu-

rate setting of the falsework bents was the key to the success of the entire erection plan. Each bent had to provide an absolute stable base capable of carrying a maximum load of 1,900 kips.

Erection was performed by an 85-ton stiffleg derrick traveler with 54-ft. mast and 105-ft. boom. The traveler was moved across river to seven principal positions as the work progressed.

To balance the weight of the 150-ft. main span, the design called for two 70-ft. concrete and steel counterweighted anchor spans. Approximately 3,000 tons of concrete counterweight were placed on each span. Because of this, tie-backs were not

Continued on page 103

Distribution of epoxy resin surfacing, followed by self-propelled aggregate spreader.

Cleaning concrete deck before acidizing.



Epoxy Resin for Worn Bridge Deck

The new bonding agent known as epoxy resin is finding many trial uses these days. An example is the use by the Kansas Highway Department in constructing the Muncie Boulevard Expressway in Muncie City, Kansas.

The resinous compound is being applied as an experimental wearing surface on the bridge deck. The compound is expected to provide a non-skid quality, imperviousness to

water, and to aid in the effective functioning of de-icing salts in winter maintenance. In discussing this development, a spokesman of the Kansas Highway Department noted that epoxy resin has gained recognition as a protection to concrete bridge floors. It is light in weight, completely non-porous, will adhere to either portland cement concrete or asphalt. By adding aluminum oxide, certain grits or other sharp

aggregate, noted this spokesman, the surface can be made highly skid resistant.

The application of the resinous surface is about one eighth inch thick adding only 3 lb. a square foot to the bridge weight. The cost is relatively high but is expected to drop as the use of the substance increases.

Specifications for this job call for cleaning the slab with a solution of



Distribution of cover aggregate by self-propelled spreader—note precision lap with previous courses.



Neutralizing acidized deck surface with water spray.

hydrochloric acid for 3 to 5 minutes, then washing with water, and drying before laying the plastic down. Best results occur when air temperature is about 60 degrees, said this report.

7-Pronged Winter Maintenance Attack

Over 710,000 lineal feet of snow fence was again set up along New Jersey state highways for the 1959-60 winter—part of an autumn get-ready program by the state highway maintenance staff which included:

(1) Overall preparations, getting snow plows and salt and sand spreaders in shape and deployed around the state, stockpiling abrasives, assigning personnel, contracting for standby trucks and men, etc. This work began in mid-summer.

(2) This winter the department will have increased manpower, more equipment, and better inter-communications for battling snow and ice.

(3) Rock salt, used on a large scale for the first time last year, abrasives, and calcium chloride will again be the department's first line of attack. Where ice or hard-packed snow make driving extremely haz-

ardous, sand is to be spread for temporary traction, then rock salt added to melt the ice and snow. Calcium chloride is added to stored sand to keep the piles from freezing hard, and also is mixed with the rock salt at 20 deg. F or below.

(4) Equipment slated for use, including heavy-duty road-graders, snow plows, blowers, salt spreaders, etc., will total 1,449 vehicles.

(5) The department will employ, or have on momentary call, about 2,576 men ready to keep the highways open—a slight increase over

last winter. Of these, 877 will be employed by contractors.

(6) Communications between department headquarters and section supervisors will be possible on the largest scale in departmental history. Well over 200 vehicles are equipped with radio transmitters and receivers, including 20 new units.

(7) For the fourth consecutive year, the department will receive weather forewarnings from the Northeast Weather Service, Lexington, Mass.



Acidizing concrete deck to etch surface before applying epoxy resin surfacing course.



CONCRETE will save taxpayers \$2,835,000 on the first 39 miles of North Dakota's Interstate 94!

North Dakota chose concrete to get the big savings where they count most—on upkeep

On the 39-mile stretch between Jamestown and Valley City—and for other sections of the Interstate System—North Dakota had good reasons for choosing concrete. *Concrete means tax savings and real dollar value.*

In North Dakota it was found that by comparing amortized first costs plus surface maintenance costs for concrete and asphalt, *concrete will save \$72,200 per mile in 35 years.*

Estimates were based on maintenance costs shown in an official study of pavements in 28 reporting states. And because the asphalt design being considered would require two resurfacings, this cost was figured in, too. Bureau of Public Roads life expectancy studies gave the schedule for such resurfacings. Final figures evidenced impressively the siz-

able year-after-year savings provided by concrete!

The reasons are simple enough! Concrete needs no special seal coatings, no periodic resurfacings—both costly items. There's far less routine maintenance, too.

Concrete is nonflexible . . . it has *beam* strength it never loses. In fact, concrete grows stronger year by year. Modern, air-entrained concrete gives built-in protection against damage caused by freezing and thawing.

Concrete highways 35 years old are a matter of record. Today's modern concrete promises 50 years and more of smooth going for drivers. Thrifty concrete on the Interstate System leaves more funds for other highways. Concrete means true economy for taxpayers, both today and in the future. It's easy to see why concrete is the preferred pavement for important highways.

PORTLAND CEMENT ASSOCIATION

A national organization to improve and extend the uses of concrete

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The thriftiest trucks, in the widest tonnage range, Dodge has ever built . . . including totally new cab-forward models with diesel or gasoline engines.

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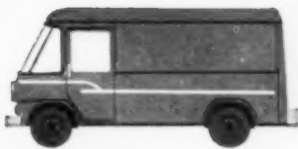
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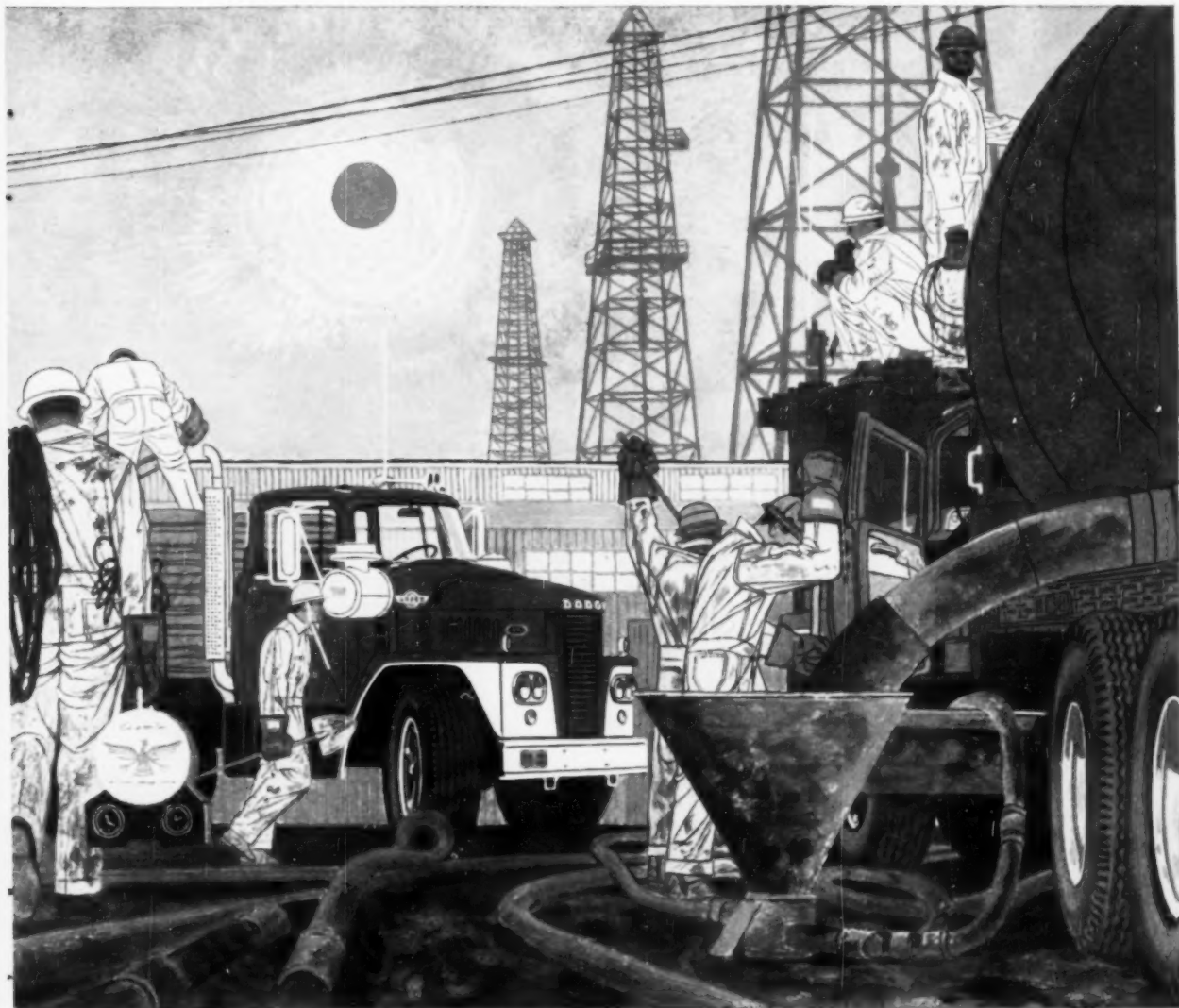
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ROADS AND STREETS, December, 1959

Front Cover Story



Each load was trimmed to prevent spillage en route to disposal site.



Loading a tangle of blasted and "drop-balled" demolition concrete, in advance of retaining wall crews for the depressed approach.

Messy Shovel Work on NYC Project

Shown here, and also on the cover is a shovel working on one of the nation's costliest urban expressway projects. A job marked with every conceivable complication of design, it is the new depressed Trans-Manhattan approach to the George Washington Bridge in New York City. This bridge is being double-decked.

Blasted granite and tangled reinforced concrete demolition refuse had been shoveled out by the P&H shovel pictured, using a fleet of Mack trucks for disposal. Note the worker trimming a loaded truck with the long-handled rake—a precaution to prevent hazard-producing spillage on city streets en route. Breen Brothers are hauling here for Brookfield Construction Co., prime contractor, for this Port of New York Authority project.

Court Decisions for Contractors

Contractor Granted Relief Against Job Interference

By the Federal District Court in Kentucky an injunction was granted in May in a suit brought by the road contractor, J. B. Michael & Co., prohibiting thirty-three individuals "from entering upon the right of way assigned to the contractor for construction before the same is opened to the public, from blocking access to this contractor's road machinery and the site of work under the contract and from threatening, assaulting and intimidating the contractor's employees in the prosecution of this work under the contract in such manner as to interfere by unlawful or violent acts with its performance."

By a contract with the state of Kentucky this contractor undertook in November, 1958 the construction of a part of Federal-Aid Highways, including grading, draining and surfacing, the construction of four bridges and the widening of the surface on the present U. S. Highways Nos. 60, 62 and 68 in McCracken County in that state.

Contained in the contract is a covenant that the work be completed not later than November 27, 1959 with provisions for liquidated damages should the work not be completed by that date. From the beginning of this project the contractor was under contract with the United Construction Workers, a division of District 50 of the United Mine Workers of America, that union being the bargaining agent designated by the majority of this contractor's employees.

With the beginning of April various locals affiliated with AFL-CIO interfered with this work and on the 14th of that month these individuals against whom the court

granted this injunction began picketing the portion of the right of way assigned the contractor, carrying banners with the legend, "This contractor refuses to allow his employees to choose their bargaining agent," by blocking the right of way and access to the construction machinery with automobiles, forcing a suspension of the work.

When later an attempt was made to resume the work violence occurred, rocks were thrown, pick handles and iron bars were used as clubs, windshields and window glass of automobiles were broken. Nine workmen attempting to resume their work were injured and seven of these were sent to a hospital where a gash in the head of one employee was closed only after twenty stitches had been taken.

Three days later the contractor appealed to the Regional Office of the National Labor Relations Board with a formal charge of unfair labor practices in which it detailed these incidents of violence and at the time, four days later, when the court heard this application for an injunction, no investigation had been made by that Board.

In ruling that the contractor be granted the relief asked, an injunction against further interference and violence, the Federal court said, "An employer is not required to negotiate or mediate a dispute with those who by intimidation, coercion, violence and threats of destruction of property, seek the right to work from those under a valid contract."

J. B. Michael & Co. v. Iron Workers Local No. 782, et al., 173 Fed. Suppl. 319, Kentucky, May 7, 1959

Interference By Rival Unions

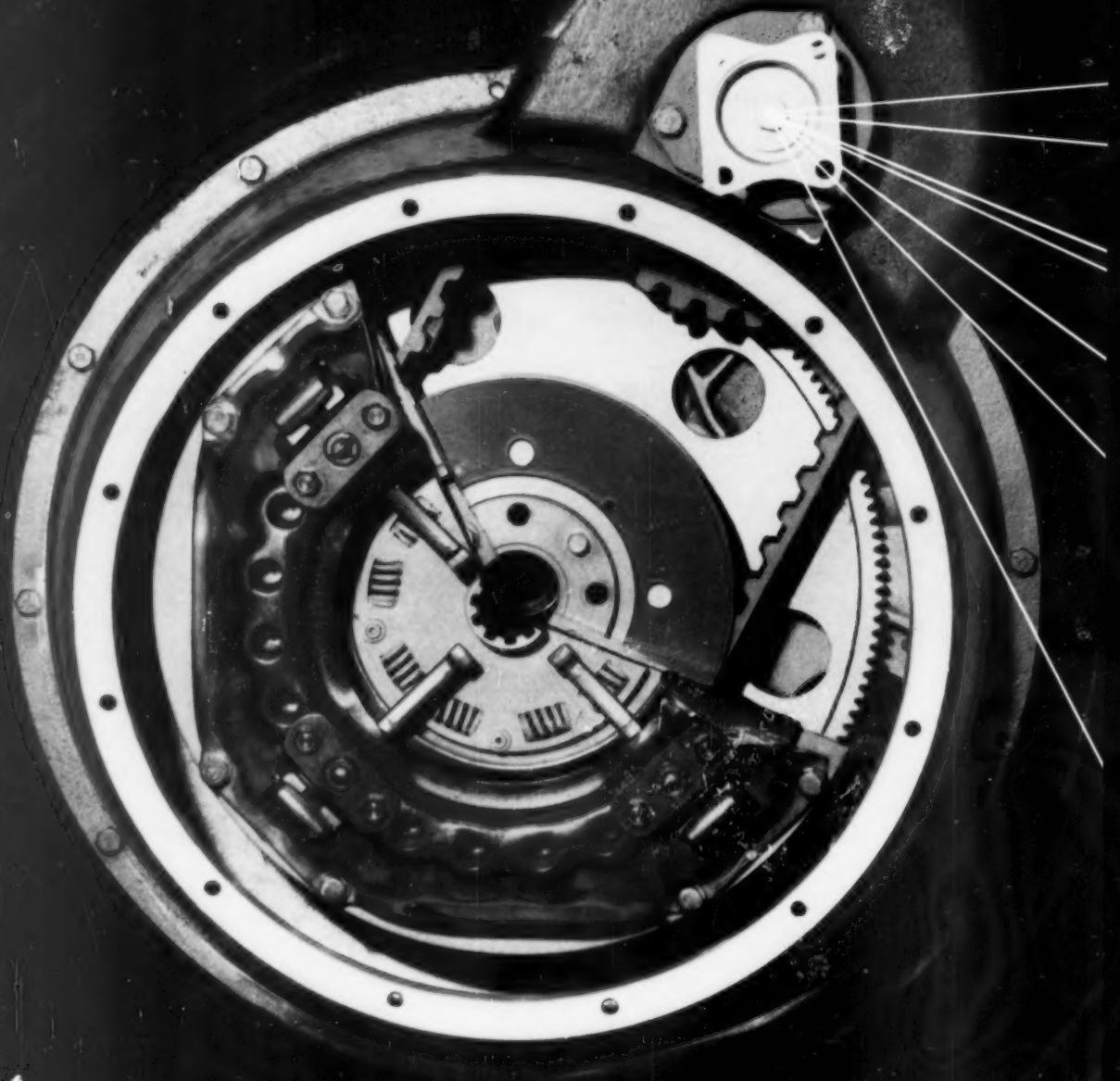
Federal construction of highways near Paducah, Kentucky, was blocked, access by the contractor and its employees to the road machinery and the site of the work hampered and employees threatened and in some instances assaulted by members of six local labor unions and thirty or more individuals.

From the outset of this work the contractor had recognized the United Construction Workers, a division of the United Mine Workers of America, as the bargaining agent of the workmen. However on the banners of the picket line of these interfering unions was emblazoned, "This contractor refuses to allow his employees to choose their bargaining agent."

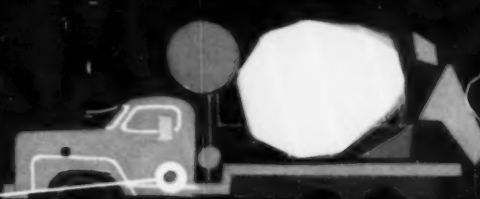
Granting this injunction the Federal court said, "An employer is not required to negotiate or mediate a dispute with those who by intimidation, coercion, violence or threats of destruction of property, seek the right to work, from those under a valid contract."

On this statement of the law the court granted an injunction prohibiting these locals and individuals "from entering upon the right of way assigned this contractor for construction before same is opened to the public, from blocking access to this contractor's road machinery and the site of work under the contract and from threatening and assaulting an intimidating this contractor's employees in the prosecution of its work under said contract in such a manner as to interfere by unlawful or violent acts with its performance."

J. B. Michael & Co. v. Iron Workers Local 782, (C.C.H.) 37 Lab. Cas. 67,267, May 8, 1959



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Gold Standard of Values

Tips on Side Dump Bucket Work

This specialist bucket is primary a loading tool, designed for fast operation in cramped space. When conditions are right for it, it "goes to town."



Fast work with loose materials—Cat 977 Traxcavator with side-dump bucket at the gravel pit of Alexco Aggregates Co., Inc., St. Louis Park, Minn.

Owners of a front-end loader are interested in lower costs and increased production. In many situations, both can be gained through the use of a side-dump bucket, notes a bulletin from Caterpillar Tractor Co.

The side-dump bucket is not a cure-all. Although it does fit all applications, it was designed for certain jobs. Like any specialized tool, it will show its true performance best under certain conditions.

First, the maneuvering of a machine such as a Cat-built Traxcavator is considerably reduced, thereby shortening cycle times. Loads can be dumped without turning, thus lowering travel distance and shifting. Operator fatigue is also lessened.

The bucket usually has a wider opening, allowing a bigger heaped load. There's greater capacity also from a side extension.

Smaller space is required for loading. Truck loading in cramped places, such as alleys and highway shoulders can be done with less maneuvering area. Trucks can get in close.

The side-dump bucket can dig, but there are other buckets that may do a specific job faster or with lower maintenance costs. For example, a general purpose bucket will dig a tough basement faster; a quarry bucket will load shot rock with lower maintenance expense.

The side-dump bucket is primarily a loading tool. Where the important factors are high loading

production and/or working within a confined space, the side dump bucket demonstrates an operating advantage. If the important factors are ability to excavate tight materials, to apply high breakout forces, to withstand the abrasion, shock and prying forces in some hard-to-load materials with minimum breakage, a different bucket may be more suitable.

Applications that are particularly suitable for side-dump buckets include handling sand, gravel, stockpiled earth or other loose material. Also street construction where traffic has to be maintained; road and ditch maintenance; backfilling trenches and around building foundations; aggregate loading and han-

dling; and pouring concrete into forms.

Getting Peak Production

1. Set the automatic lift kick-out mechanism of the side-dump bucket just high enough to dump effectively into the truck. This will cut time from excessive lift heights.

2. Spot the truck the same distance it takes for the hydraulic system to lift the bucket to dump height. This is usually about $1\frac{1}{2}$ times the length of the machine. With less maneuvering time, the side-dump bucket can be dumped sooner. And correct travel distance will make a smoother operation.

3. Start dumping as soon as the truck body is reached.

4. Pass as close to the truck as possible. Operators sometimes cut to the left, behind the truck, to load the bucket. This gives a better view of the truck on the return.

5. "Cock" the machine slightly toward the truck when dumping the last load or two. This throws the load to the center, for even distribution.

6. Save time on bucket control movements after dumping. Shift to forward direction before returning bucket from dump position. Side dump and bucket tilt controls can be operated together to bring the bucket to digging position—still at dumping height. By this time the truck is cleared and the bucket can be lowered, ready for digging.

7. Keep forces on the bucket directed into its supporting saddle. Avoid back dragging and any prying action that pulls the bucket away from the saddle.

8. Increase production as well as stability with a ripper (a counterweight is an advantage).

BIGGEST CORRUGATED UNDERPASSES?

Continued from page 71

Hot dip galvanized sectional plate material is used for the two truck passes, according to Republic Steel. The plate is of three-gage steel in the top, bottom and corner plates, and one-gage for sides. Sloped ends are step-beveled 2:1 from the top corner plates. The step-beveling leaves the crown, bottom and corner plates square. Only

the side plates above the corner plates are beveled so as to conform to the embankment slope.

The arch structures were assembled from individual curved sectional plates of standard size and gage. The two truck passes are special as to size and shape.

Assembly work was performed on the line and grade of the finished structures. The plates were lifted from road level by a power crane. The curved sectional plates were assembled according to prints furnished by the fabricator and completely bolted together using $\frac{3}{4}$ -in. diameter bolts. Four bolts per foot of longitudinal seam were used.

Working from a flatbed truck, driven inside the sectional plate truck pass structures, workmen assembled plates and did preliminary tightening. After the structures were completely assembled and all bolts were in place, pneumatic wrenches completed the tightening. Hardwood 6 x 6s were used for up-rights, stringers and struts. Compression caps were of soft pine.

The general contractor was Albert Lalonde Co., Sidney, Montana; Andy Stolzenburg, general superintendent. Roy Armstrong Company erected the sectional plate. Distributor was Eaton Metal Products Co., Billings, Montana.

Fred Quinell, Jr. is state highway engineer. The project was under George A. Barrett, division engineer, with Lefty McGuinn serving as project engineer.

BRIDGE CREW SPANNED RAPIDS

Continued from page 92

required during cantilevering across the river.

The arched main span of 450 ft. is the longest continuous plate girder span in the Western hemisphere. The built-up girders were fabricated by Bethlehem at its Rankin, Pa., works and shipped in sections to the site. The heaviest section weighed 59 tons, the longest measured nearly 96 ft.

Because of the 16-ft. girder depth at bearing ends, two sections at each end were fabricated and shipped in horizontal halves and assembled at the erection site. Alloy rivets were used for all shop connections. Field connections of the girders

were made with high-strength rivets. High strength bolts were used in the bracing system between girders.

The bridge roadway will be paved with a 1-in. asphalt plank laid on top of a 7-in. lightweight concrete slab.

Erection was under the direction of George B. Shaw, Jr., manager of erection for Bethlehem's Pittsburgh district. Ervin W. Slockbower was project manager, Ernie Heiston field manager, and Harry Hiscott superintendent.

Bucket Makers Form CIMA Bureau

Another Bureau of the Construction Industry Manufacturers Association, the Bucket Manufacturers Bureau, has been formed under CIMA sponsorship. Charles J. Polinek, Bucket Division Sales Manager of Erie Strayer Company, Erie, Pa., has been elected chairman, and W. H. Botten, Vice President, The Owen Bucket Company, Cleveland, Ohio, vice-chairman.

Several CIMA member companies were instrumental in setting up the new group. Applications for membership have been received from other American manufacturers of buckets who will be eligible upon their becoming CIMA members. The founder members are: Blaw-Knox Company, Electric Steel Foundry Co., Erie Strayer Co., The Hayward Co., Industrial Brownhoist Corp., C. S. Johnson Co., The Owen Bucket Co., Pettibone Mulliken Corp., Schield Bantam Co., and The Wellman Engineering Company.

This is another in the growing list of Bureaus being organized within the framework of CIMA, wherein manufacturers of like equipment may discuss mutual problems, report business statistics, promote the use of their products or services, or embark on any other program that would be beneficial to the industry.

LOSS OF CONTROL ON CURVES has accounted for 31 percent of all fatal accidents in Colorado during the last five years, according to a report prepared by Allan R. Pepper, traffic engineer for the Colorado department of highways.

Job Accidents Center Around Equipment

Those attending the Construction section of the recent National Safety Congress heard warnings about the prevalence of unsafe construction practices. But the accident statistics were countered with some reports of unusual contractor working conditions which brought chuckles and "glad it's not me" from the audience.

More than 400 contractors, state and local highway department representatives, federal officials and insurance company engineers attended the Construction meetings during the Congress, October 19-23, in Chicago.

Along with strength and performance in a piece of construction equipment, the buyer is lax in not demanding maximum safety for the operator and the mechanic, said Arthur J. Rutherford, chief of the evaluation engineering branch, U.S. Army research and development laboratories, Fort Belvoir.

He quoted from a 1942 report on mechanical equipment accidents prepared by the Corps of Engineers:

"Accidents resulting from the operation and use of mechanical equipment comprised 30 percent of the total accidents reported on Corps projects, and they produced 42 percent of the days lost from all accidents. A total of 36,338 lost-time injuries were reported of which 10,964 involved mechanical equipment.

"Heavy construction equipment in turn—tractors, bulldozers, cranes, derricks, draglines, shovels, graders, mixers, crushers, batch plants, etc.—accounted for 40 percent of the lost time accidents related to equipment, while motor vehicles or trucks accounted for 34 percent. Of the eight predominant unsafe practices, 12.5 percent of all injuries

were caused by slipping and falling in getting on and off standing or moving equipment. Inadequate maintenance was the cause of 10 percent of all accidents."

Much attention has been given by safety personnel to operating practices, Rutherford said, and much effort has been concentrated on persuading or forcing the man to adapt himself to the machine. Far too little emphasis has been placed on designing the machine to fit the man. Today, deaths resulting from diseases formerly dreaded, such as smallpox and diphtheria, are almost insignificant. Perhaps a similar preventive approach might be taken to this "accident disease" which seems to plague the construction industry, he suggested.

Rutherford referred to experiments conducted by Col. Earl Wheeler, a reserve Corps of Engineers officer and a professional safety engineer in civilian life. Col. Wheeler himself took the podium next to describe these tests.

After being given the use of a 20-ton off-the-road truck crane, he proceeded to investigate the practice of safety in relation to the design of the crane. He drew up a basic procedure for this under the heading "Job Hazard Analysis." The main divisions of effort were the job breakdown, analysis of each operation in detail, devising a new job method, and testing this new job method.

He took motion pictures of 24 of 51 basic operating actions pertaining to the crane. Each of these steps then was analyzed, frame by frame, and the accident types potential in each step were listed by a code number, a descriptive phrase, and the severity factor of the acci-

dent. The latter was gained by prorating the days lost due to each type of accident.

The final steps after the analysis were the devising of new job methods to reduce hazard exposure, and the testing of the new practices under the same conditions as the old.

Another speaker, George Ferris, president of Raymond International, Inc., related some of the problems encountered in construction overseas, with emphasis on safety hazards.

"Much of our highway work," he said, "is in remote areas of Thailand, Liberia, Colombia and Kenya where we operate from construction camps deep in the jungles. The safety problems are numerous.

"The first precaution we take, of course, is to inoculate all our men for every possible disease that is known to occur in the given area. Next, the camp, which is a major headache. The site must be carefully selected to be sure of good drainage, water supply and relative freedom from disease. Since most of our jobs are in or near the tropics, disease is a major problem, with epidemics can develop overnight. So we are extremely strict about cleanliness.

"Although we try to maintain the most modern medical facilities in our camps, we occasionally have a tough time administering to local workers. In fact, if we don't treat an injured worker quickly enough, we're liable to find him back in the native village under the care of the resident witch doctor. And this care is weird. The local witch doctor often will treat a broken leg by breaking the leg of the nearest chicken he can find, then hanging the fowl up on the wall of the hut.

According to custom, if the chicken pulls through there's hope for the worker. If not, the witch doctor might even make sure the man doesn't survive—just to preserve his record."

Ammon Schreur of the construction firm of Pickett and Schreur, of Allegan, Mich., spoke of preventive steps taken by the accident prevention committee of the Michigan Road Builders' Association. With the help of Michigan State University, the committee was able to develop a safety training course for highway construction supervisors.

The first course held in January, 1954, was followed by six other courses with more than 200 highway construction supervisors and foremen being trained. The course acquaints managers, superintendents and construction foremen with safe construction practices and the methods of selling them to the men. Sample programs outlining the course are available for any parties interested.

Fifty to 60 percent of the work of the training courses is directed toward employee relations, with the remainder dealing with safety techniques, Schreur said. In 1957 a "Safety Cavalcade" sponsored by the accident prevention committee made a 10-day tour of the state, conducting one-day safety sessions for a total of 600 to 700 highway construction personnel.

Safety Nets, Better Scaffolding Required

Construction accidents of the past decade have led to a full revision of the New York State's Construction and Demolition Code, as reported by chairman H. Myron Lewis, of the Board of Standards and Appeals.

The latest amendment to Industrial Code Rule No. 23 will become effective November 1, 1959. The rewritten code now covers all construction work, whereas the previous version governed largely building construction. The new code now sets up requirements for excavation, trenches, land clearing, moving of buildings, removal of machinery from buildings, and even the removal of dead trees.

The code will affect in particular the large number of bridge projects now under construction for New York state, according to Lewis. For example, life nets must now be sus-

pending beneath working surfaces which are 50 ft. or higher above land or water. In addition, safety life belts will be required much more extensively in many types of construction work.

An important part of the revised code deals with new types of scaffolding. The earlier version provided safety measures for chiefly wood scaffolding. Chairman Lewis explained that new types of metal scaffolding and mobile scaffolds were now being widely used and were covered by safety provisions in the amended code.

Danger Lurks Under Booms and Buckets

By Earl W. Wheeler

U.S. Navy Bureau of Yards and Docks, as reported in "Construction Safety Hints", National Safety Council

Accidents involving men working or walking under crane booms and buckets are infrequent, but, of those that happen, many are fatal.

Even if the crane is in excellent condition and is being run by a first-rate operator, it is never wise to expose men needlessly. Usually, the victim is a laborer doing an assigned job which has nothing to do with the crane.

The rule is simple: "Do not permit men to stand, walk, or work under crane booms, buckets, or suspended loads." A companion rule is the one on hard hats: "Hard hats shall be worn by all men working in the vicinity of cranes, scaffolds, or in any place where an object may fall from overhead." This rule helps to take care of men who just won't "stay out from under."

How are men to be kept from standing, walking, or working under booms, buckets, and suspended loads?

Prior planning of crane operations should take into account the area to be covered by the swing of the boom. Cranes should be positioned so that the boom or bucket cannot be swung over workmen. Otherwise, operations should be scheduled only for times that men are excluded from the swing area.

In a congested work situation, the swing area should be roped off or barricaded, and signs should be posted to keep unauthorized persons out of the hazardous area. In extreme cases, it may be necessary to post a watchman or traffic controller.

In concreting operations, it is especially necessary to keep all persons away from the vicinity of the

bucket travel. A chunk of semihardened concrete frequently drops from the bucket and can produce a serious injury even if the victim is wearing a hard hat. If he is not wearing a hard hat, the bump may be fatal. Puddlers should be kept well in the clear, both when the crane operator is landing the bucket and during takeaway.

Fort Pitt Tunnelers Cited for Safety

In recognition of more than one million man-hours of work on the Fort Pitt Tunnel without a disabling injury, Merritt-Chapman & Scott Corporation has been presented the Award of Honor of the National Safety Council for establishing "the best record for tunnel, caisson and shaft construction." The award honors more than two years of work by Merritt-Chapman, covering the period of April, 1957, to August, 1959.

Being built for the Pennsylvania Department of Highways, with the participation of the U. S. Bureau of Public Roads, the 3600-foot-long-twin-tube vehicular tunnel cuts under Mt. Washington and joins a new bridge spanning the Monongahela River.

Kansas Highway Workers Are Liability-Insured

Highway employees in the Kansas state highway commission who drive state-owned vehicles are now covered by insurance, under a contract which includes bodily injury and property damage liability. A contract to cover the employees was purchased on bid through the Kansas state department of administration.

The insurance reportedly costing \$43,281 protects operators of commission vehicles to the extent of \$50,000 for each person injured or \$100,000 total bodily injury in each accident; also a property damage liability of \$50,000 for each accident.

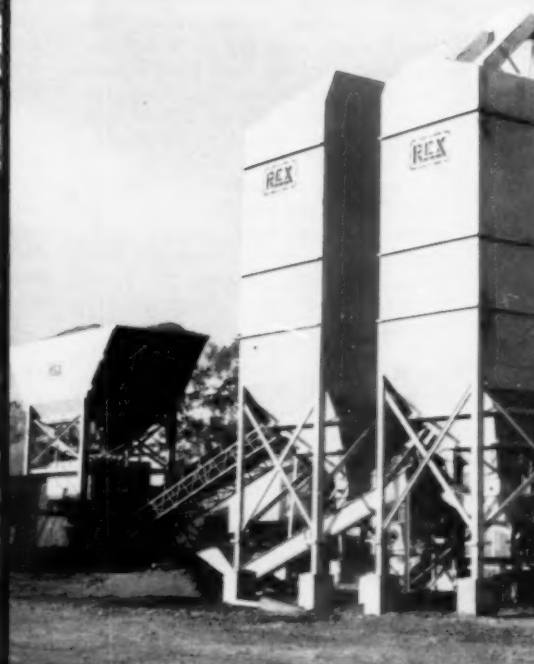
Before bids were asked, insurance companies planning to bid were given data on the accident record in the commission's operations. During a recent 12-month period 131 commission vehicles and 116 privately owned vehicles were involved in accidents with injuries to six persons.

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- Fully automated operation with just 1-man, push-button Rex-O-Matic Control.

Increase your production and profits with a Rex Portable Central-Mix Paving Plant. There is exactly what you need in type, capacity and cycle speed. See your Rex distributor or write for full details. CHAIN Belt Company, 4652 W. Greenfield Ave., Milwaukee 1, Wis. In Canada: CHAIN Belt (Canada) Ltd., 1181 Sheppard Ave. East, Toronto, Ontario.

1 Horvitz Company, Cleveland, adds impressive speed and economy to the Ohio Expressway near Painesville with this portable Rex Plant having 460-barrel cement (plus 350-barrel storage) and 125-ton aggregate capacities. A 6-cu.-yd. Rex Tilt-Up Mixer. Plant operation is entirely automatic with Rex-O-Matic Controls.

2 M. F. Velotta & Sons, Inc., Cleveland, speeds road job with Rex Model 125 Porto-Plant with 6-cu.-yd. tilt-up mixer. Quick-acting batching of cement and aggregates gives fastest output of consistently quality-mixed concrete. Rex-O-Matic Control gives 1-man, push-button operation.

3 Foley Construction Company, Norwood, Ohio, gets top-speed production with a Rex Model 60 Porto-Plant charging two 3-cu.-yd. Rex Tilt-Up Mixers. Rex Horizontal and Vertical Screw Conveyors give dependable, positive cement delivery—there is no cement on belts!

4 Visintine & Co., Columbus, supplied concrete for the Ohio road job with this Rex Model 125 Porto-Plant for central-mix road paving. While a completely portable plant, it has cement storage totaling 1630 barrels. A 7½-cu.-yd. Rex Tilt-Up Mixer delivers highest quality concrete to haul units in fastest cycle time.

*Names supplied on request.

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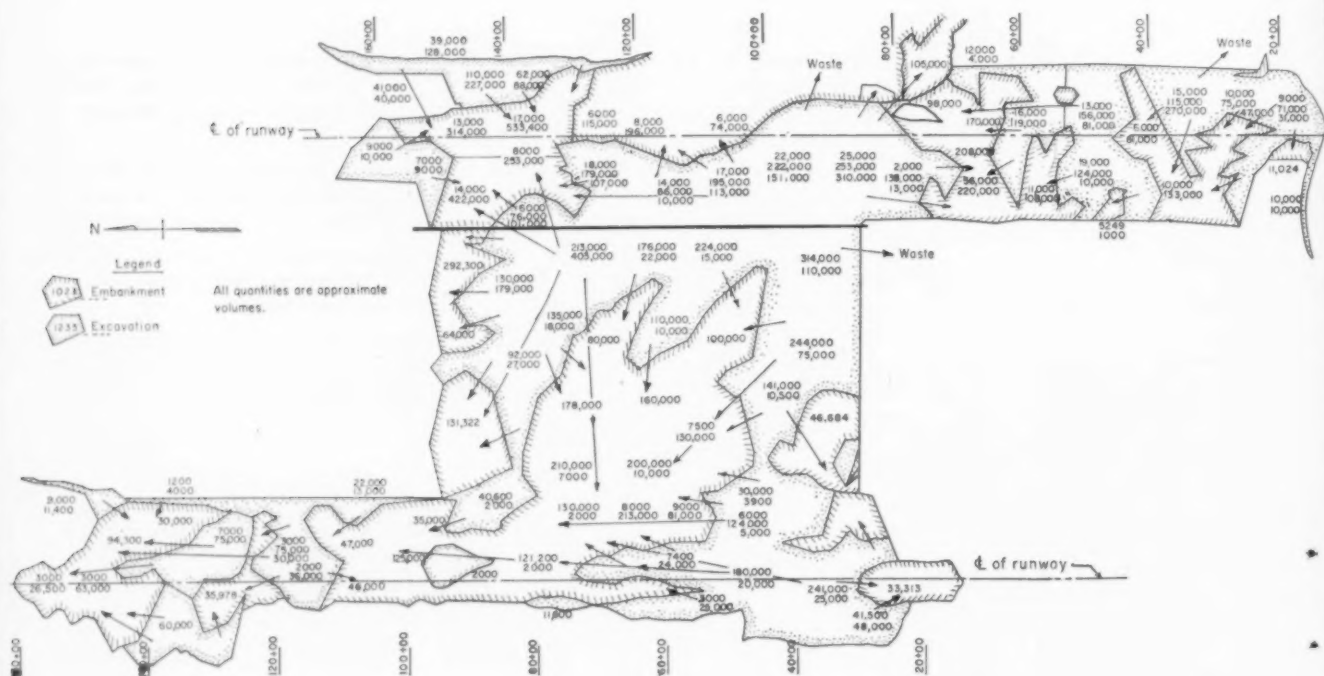


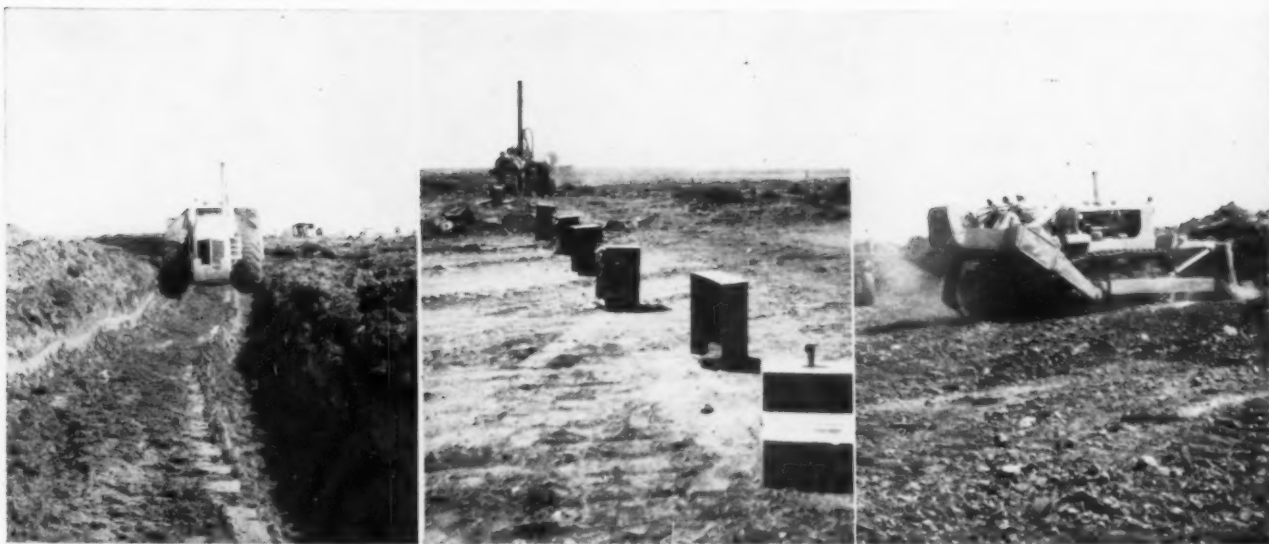
Northwest No. 6 backhoe followed the drill crews here to excavate deep pipe ditch through shale. Dozer keeping spoil shoved back to make work room.



Excavating around manholes and drain junctions was done with a Gradall among other units.

Earth distribution diagram, showing the highly dispersed effort required of the five equipment spreads used. Multiple numbers as for topsoil, rock, clay, etc. (shown in various colors on contractor's large-scale work sheet.)





Preliminary ditching, done to help dry out the workings, was a big early task. A twin-engine Euclid scraper teamed with dozers, quickly opened hundreds of feet of trench down to shale. (Center): Explosives cartons set up to mark off loading area for workers. (Right): Wholesale ripping was required in shale; this Sheppard hydraulic ripper on a Dg was one of several units used.

SHOW CASE JOB

Continued from page 56

Drilling and blasting for the channels have followed a fairly constant procedure, typically described in the following (also see accompanying sketches). Blast holes are sunk by an Ingersoll-Rand Drillmaster for the large holes in the central portion, and by several smaller track-type drills (I-R and Gardner-Denver) for the outer holes.

Hole production in the variable shale has averaged about 825 ft. per day for the Drillmaster,

using 6¼-in. tungsten carbide insert bits (Roc-Bit). Bits have lasted 2,000 to 3,000 ft. Production for the smaller drills is 800 to 1,100 ft. per day, using 3½-in. bits (Brunner & Lay and other).

Loading of a 6¼-in., 30-ft. hole typically has consisted of 25 lb. of DuPont Nilite FR (treated ammonium nitrate) in the bottom, 10 lb. of Red Cross extra dynamite, another 180 lb. of Nilite, and about 13 ft. of stemming. When holes are wet, Nilite WR is loaded in 25-lb. asphalt laminated round burlap bags. Also two or three sticks of

Drilling a line of ditch holes in shale, using Ingersoll-Rand drills on hydraulic booms, mounted on Cat D8 and powered by an I-R rear-mounted compressor. Two such units kept ahead of a heavy pull-shovel.





Michigan 480 dozer combined spreading and compacting functions, with time out here to help push-load a twin-engine Euclid scraper. Plenty of pusher-power was one of Langenfelder's keys to remarkable production.

gelatin are added as a booster in addition to the primer charge.

Millisecond delay methods have been employed for efficiency and good fragmentation. Delays typically work out from "O" along the centerline, Dupont caps and MS delay caps are detonated by a CD-48-1 blasting machine. Relatively large shots have been practicable, the largest consisting of 429 caps and yielding 27,300 tons.

Drilling for shooting pipe ditches is done with track mounted drills and with D-8 mounted rigs, each carrying two wagon drill units on hydraulic booms. Pipe ditch excavation has made steady work for a Northwest 6 and several smaller backhoes.

Project engineer for C. J. Langenfelder & Son is Bill Hazelhurst, project engineer is Bill Gable and field superintendent is Sam Marshall.

Continued on page 112



Tandem push-loading—two Cat D9s behind a Cat DW20 tractor-scraper combination, making smoke come out of partially ripped shale.

New Policy Environment

Continued from page 57

referring to the "contract control" plan announced last month, there will be plenty of work for road-builders, he predicted.

"I can assure you that there will be a large-scale construction program during the coming year. This will enable the pace of the highway program to continue in those states which now have no unobligated balances for highways.

"For those states that still have unobligated balances, we will afford them the opportunity to use as much of them as the condition of the Highway Trust Fund will permit. Most of this new contract authority will be available between January 1 and June 30 of next year, a time when the highway programs for the next construction year are being put into effect.

"From what I have told you, you can see that the great highway program will continue uninterrupted. On account of the large amount of work now under way or authorized, next year will see a record amount of highway work actually completed, even as new plans and contracts are being made at a rate satisfactory for all concerned; for contractors to keep their men and machines employed, for the states to keep their organizations going, and for the public who will have the assurance that their government is continuing to meet their needs.

"The public will have one added assurance. All of this satisfactory progress will be brought about on a sound financial basis. There will be no resulting deficits in the general fund, and the highway trust fund will be maintained in close balance between income and expenditures."

In addition to contract control, the federal government is going to be more concerned about priority of projects, continued Allen. And the Administration will definitely review the direction of the big public works plan, "to assure ourselves that we are still on our way to our original goal." Urban projects, particularly, he said, need to be reappraised in the light of total metropolitan area transportation needs.

New financial management, Allen said, was most immediately

urgent, thru programming of work.

"Clearly the methods and criteria used in project selection will have to be revised and improved to accompany the financial management improvements which have become necessary at this stage of the highway program. From better selected and better timed projects, the public will reap rewards from sounder projects and quicker availability of service. The public and the highway user should support our efforts to improve highway programming."

The third management area will be a reappraisal of highway policy goals. Mr. Allen implied that the whole concept of the Interstate System in urban areas may be reviewed.

An original concept of the Interstate System was that of a backbone network to serve inter-city, cross-country traffic and thus serve the dual purposes of national defense and economic development. Only enough routes were to be run into cities to siphon this traffic in and out and emphasis was to be on bypass routes. In 1956, Congress drastically remodelled this concept by declaring that thereafter highway planners must give equal consideration to local needs. Municipal interests intended this to mean that the Interstate routes into cities were to be large enough to carry commuter traffic, with its tremendous peak-hour demands, and redesigned with enough interchanges to permit frequent access to the expressway by local users.

This one feature alone would add 63 percent more grade separations, interchanges and frontage roads, producing a 15 percent increase in the total cost of the System—billions of dollars, according to the BPR. Fully half of the cost of the 41,000-mile System can be traced to urban segments under this concept.

Mr. Allen's revival of the term "inter-regional" indicates that the Administration may attempt to force a return to this original concept and thus eliminate from federal responsibility those costliest urban sections of the network.

Mr. Allen was concerned, too, about the effect of urban expressway construction upon urban area planning.

"Urban extensions of the Interstate System often cut across the grain of established urban patterns, not only of highway traffic, but of the more fundamental urban planning and development. The major criticisms and comments on the Interstate program center in this urban relationship," he said.

"Many believe that the augmented program for the Interstate System has forced a fundamental issue of urban planning concepts upon the American cities and their metropolitan areas. This has been voiced frequently by city planners and by others interested in fundamental urban affairs. In fact, the urban Interstate routes have been designated in the metropolitan areas ahead of the planners, and before most cities have developed urban master transportation plans. Now that planning, particularly urban transportation planning, is catching up to the Interstate route designations, there is need for some policy re-evaluation.

The national traffic movements that must be accommodated in each metropolitan area have been given in outline form, Allen said. The national government has also given its commitment for financial assistance to these national routes. Federal assistance will be furnished up to 90 percent of the cost. Local planners, therefore, have advance knowledge of the general traffic corridors that must be developed in the national interest. As a result, their problems should be centered in the specific relationships between local transportation movements, local development plans, and the needs of the national plan. A great deal more work must be done in this area.

He bluntly declared that the Interstate system in urban areas must not be considered "a means of solving local traffic problems." Its function in these areas is merely to provide access for Interstate traffic.

If planners want to relieve local traffic congestion, they must begin to think in far broader terms, Mr. Allen asserted. "It is unthinkable that the Interstate routes in urban areas should be developed ahead of

Continued on page 181

Grading Equipment at Chantilly

Tractors

- 24 Caterpillar D8s (including dozers)
- 11 Caterpillar D9s (including dozers)
- 1 Caterpillar D4s
- 3 Allis-Chalmers HD21s
- 2 Euclid TC12 twin-engine
- 1 Michigan 480 rubber-tired

Rippers

- 4 Caterpillar hydraulic
- 1 Sheppard hydraulic

Scrapers

- 6 Caterpillar DW20s
- 3 Caterpillar DW21s
- 6 Euclid TS 24s (twin engine)
- 1 LeTourneau 100-yd.
- 1 Caterpillar 40-yd.

Haulers

- 24 Euclid bottom-dumps
- 2 Euclid elevating loaders

Motor Graders

- 8 Caterpillar 12 motor graders

Drills

- 1 Ingersoll-Rand Drillmaster
- 2 D8 mounted rigs
- 1 Ingersoll-Rand Crawl-IRs
- 1 Gardner-Denver Air-Tracs

Compressors

- 4 Ingersoll-Rand 600 cfm's
- 2 Worthington 125 cfm's
- 1 Gardner-Denver 185 cfm's

Compactors and Tampers

- 4 Buffalo-Springfield Kompactors

9 Tampo 50-ton pneumatics

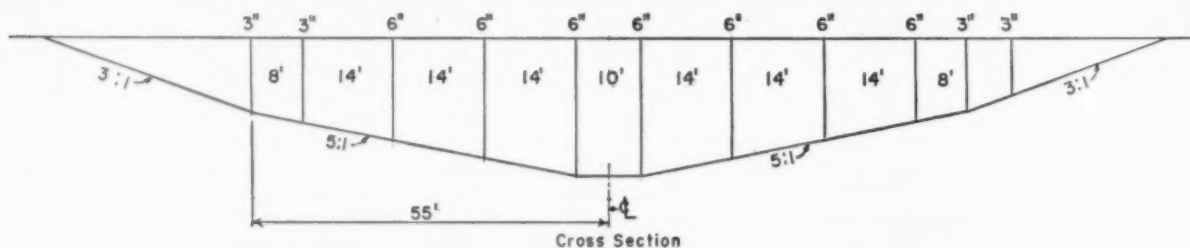
- Ferguson 50-ton pneumatics
- 16 Tampo dual-drum sheepfoot
- 3 Essick vibrating steel rollers

Tampers

- 6 J-12 vibrators (tampers)
- 2 Triplex tampers
- 1 Barco tamper

Excavators

- 1 Northwest Model 6 crane
- 2 Northwest 80-d (2½-yd.) shovels
- 2 Bucyrus-Erie 38-B (1½-yd.) backhoes
- 1 P&H shovel (3½-yd.)
- 1 Northwest truck crane (20-ton)
- 1 Northwest truck crane (25-ton)
- 1 Lima Paymaster shovel



Drill pattern for one of the wide drainage ditches at Chantilly. (Depth here 21 ft., elsewhere 30 ft. max.) Shale material shot using millisecond delay pattern working out from "instant" along the centerline.

Carving a huge perimeter drain ditch from shale at Chantilly airport. P & H 3½-yd. shovel dispatching Euclid bottom-dumps.



Continued from page 110

(Editor's Note: Paving records also have fallen at Chantilly this past summer. Langenfelter's crew on August 14 placed 5,435 cubic yards in a single day—equivalent to 8,000 feet of 9 in. x 24 in. highway pavement—made possible by a high-capacity spreading and following train and centrally mixed concrete (no pavers) for this 450,000 cubic yard concrete paving project).

\$300 Million Funds Still Diverted

Raids on road funds are continuing across the country, reports the National Highway Users Conference. In 1958, \$303,326,000 in state highway user tax receipts was diverted to non-highway purposes, according to an NHUC analysis of data recently released by the Bureau of Public Roads.

Taken nationally this sum represents 6½ cents of every dollar of receipts available for distribution from state highway user taxes. For states where diversion actually occurred, 9 cents of every dollar was lost to highways.

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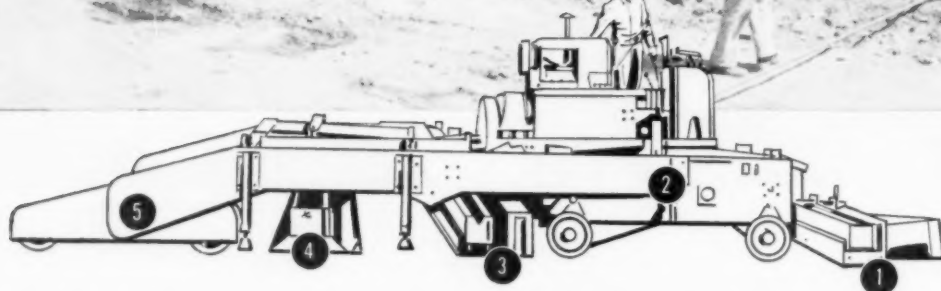
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Unscrambling Mr. apRoberts' November Cost Control Article

The article, "Constructive Cost Keeping for Contractors," published in November, brought the Editors heavy fan mail. One reason is the basic nature of this article, which gets to the heart of the contractor's profit-making ability.

Another reason for some of the letters: to call attention to page 161, where the two paragraphs which should have appeared first were run as the last two paragraphs.

This extremely stimulating and provocative review by Mr. apRoberts, we hope, will not be marred completely by this occurrence. Any reader who wishes to re-read this basic discussion of cost keeping should on turning to page 161 in November Roads and Streets simply read the last two paragraphs first, then begin at the top of the page and read down. This portion of the text is reproduced on this page in its correct form.

Sorry this transposition of type occurred. Look for further articles in Mr. apRoberts' series, which will get into specifics on how to set up workable cost keeping and use it in profit control.

The following is how the article, "Constructive Cost Keeping for Contractors," should have read in the page 161 continuation, November, 1959, Roads and Streets.

COST CONTROL

The purpose of these few questions was to make its people cost control conscious. It had already obtained advice from qualified experts who pointed out the fact that problems common to one firm are often found in a great many others the main difference being not in the problem, but in the cooperative effort that is developed to obtain a solution.

The results of this questionnaire were twofold. First, the Accounting Department noted some reduction in expenses; and, secondly, there was unanimous agreement on a revised motion to introduce Cost Controls after first developing an acceptable program in which all of the departments could participate. The people from each department were

to present their own ideas for this, and then they were to be standardized by the Accounting Section.

In review, it can be seen that the people at the "U. & I." Company were made to realize that Costs are a part of every one's administrative problems. They also saw that you don't just say: "We're going to have Cost Controls," and there they are.

In fact, the first step is to develop a curiosity about getting some Cost Controls, in order to see if they may actually be of value in helping to keep expenses down—by providing a useful factual means of showing where the money goes.

The second step is to get these same people to try and come up with their own ideas, and thus become receptive to suggestions. They must welcome ideas which others will have ready to offer them, based on actual experience in developing and applying Cost Controls.

With these introductory steps accomplished, and the people who will have to put Cost Controls to work, ready to begin, then the Operation of a Cost Control System is ready to be considered.

Sealant Helps Mount Bearings Faster

The Acme Road Machinery Company of Frank, New York, replaced a 9-in. spherical roller bearing in the jaw of a rock crusher in less than an hour—instead of the three to four days formerly required—and saved \$155. These savings reportedly were made possible by mounting the bearing with a slip fit and retaining it with a special sealant, instead of the interference press fit previously used. The sealant was Loctite.

When this bearing was assembled with a press fit it was first necessary to remove $\frac{1}{4}$ in. from the housing I.D. by a boring operation; then deposit a $\frac{3}{8}$ -in. thickness of weld metal on the exposed surface; and finally, re bore the housing to provide a .0015 in. interference fit between the bearing and the housing. In addition to the preparation of the housing, it took two men several hours to install the bearing.

Now, using the sealant, Acme's mechanics simply use a clean rag to wipe the O.D. of the bearing and the I.D. of the housing, roughen the mating parts with emery paper, apply sealant to both surfaces, and assemble the bearing with a light

push fit (clearances are approximately .003 in.). The liquid sealant between bearing and housing starts to harden in 30 minutes. Complete hardening takes 12 hours, leaving the bearing tightly gripped. The grip holds in severe crusher service.



Sealant being used to retain 9 in. bearings in jaws of a crusher.

Editor's Note: The history of the road-building art is one of struggle to accomplish construction that will give a full measure of public service. If a road is to be durable, low in maintenance, as safe as intended, and represent a good "dollar's worth" for the public funds, it must be constructed throughout in accordance with plans and specifications—which themselves of course must be in step with our advancing technology.

Every highway administrator intends that the job will be built right; that's what he's hired for. Carrying out the task everywhere, everyday, in our big program depends today on management skill of a high order. While the contractors today are more enlightened and public spirited in this matter than formerly, their primary motive must remain that of getting production and making a profit. It's finally up to the engineers.

Hence, despite this growing enlightenment, it still falls to the owner-agency—the various highway departments—to give a major role to field inspection and the contractor's quality compliance. This task is growing more complex and exacting every day as highway design advances, and as new materials and equipment enter the picture.

The question has several aspects:

1. What are the organization techniques? Inspector training is a principal key, but means of follow-through, and internal organization liaison are also on the keyring. An administration may keep the specifications up-to-date, and have an able lab force, only to have the whole effort fail on the battlefield because the resident engineers and inspectors aren't doing their job well enough.

2. What is the cooperative setup for keeping the construction technology abreast of the times, and getting the best cooperation from the contractors?

Points 1 and 2 are being covered in the Kansas road program as described in this issue. Reports on other states will follow, and eventually we'll get into some of the actual construction practices that are of the most concern today. Meanwhile, comments from readers are invited.

3. What do you want to build? What details of practice have been adopted that require systematic field testing and project control? Recommended practice for grading and embankment, drainage, subbase and base, structures, various pavement types, and other parts of the job will be presented in a series of "refresher-course" reviews in future issues of Roads and Streets.

The New Contractor-Engineer Relationship One of a Series

By Walter Johnson

State Highway Engineer,
State Highway Commission of Kansas

Getting Good Construction

In the Road Program

This highway department has stepped up recruitment and training, particularly of inspectors and field engineers; and drawn contractor associations, material producers and colleges into the act.

Shortly after the war, this department recognized the importance of improving our job inspection practices and quality control procedures. Our first effort in 1946 was to institute training schools for construction and materials inspectors. This effort has been continuing and expanding since that time.

Our principal objectives have been to provide competent personnel and to adjust inspection practices and quality control procedures to keep pace with the continually increasing and high production schedules initiated by our contractors.

The principal problems in connection with this effort, have been to retain competent personnel, once acquired and trained; and to overcome objections and opposition to change when existing practices of long standing are altered.

Our first training schools for construction and materials inspectors were held annually for a period of three months during the winter beginning in 1946, and continuing until 1949. These schools were held in the headquarters offices and accommodated about 30 men each year. As our ability to acquire technically trained personnel increased, the length of time scheduled for these schools was reduced.

In 1950, it became apparent that we could no longer handle this program on a central basis, so the program was transferred to our six division organizations. An annual training school has since been held in each division. The instructor personnel are experienced division employees, assisted by specialists from headquarters departments. The subject matter covered include job inspection practices; quality

control procedures; problems encountered in the preceding construction season; and dissemination of information on new construction items, specifications and methods that may be anticipated in the coming season.

In addition, we have annual meetings in each of our divisions attended by all inspection personnel at which subjects of a more general nature are explained and discussed by headquarters staff.

Three years ago, we instituted what we call our Undergraduate Program, in which the principal objectives are to provide income for students attending the state's two engineering schools and to develop interest in the department's work. The hope is that these people may eventually be retained as part of our engineering staff when they graduate.

This program provides summer work for students beginning with their senior year in high school and extending through their college career. This provides a pool of partially experienced people to augment our regular staff during the summer construction season. Approximately 120 boys are enrolled in this program annually. After three years of operation, we are beginning to see some very satisfactory results from it, both in the quality of the summer help we have available and in the results of our recruitment program of graduates at the two state schools.

Two years ago, we instituted a training program for graduate engineers. The objective is to provide new engineering employees with a relatively broad experience throughout the various engineering departments within the organization, and to upgrade their com-

petence in whatever may be their final assignment. About 25 men are enrolled in this program, which extends 75 weeks. Two men have already graduated from the program and received their final assignments.

We have found that the existence of this program has been very helpful in obtaining technical personnel upon graduation from college. It should help in improving these men's competence in job inspection and quality control practices when they are assigned to such duties.

An annual two-day conference is also held for all of our field construction personnel and inspectors from our materials department. At this conference, problems in interpretation of specifications, adoption of job inspection practices or quality control features are taken up. And other problems of a like nature are discussed between staff engineers of the headquarters departments and the field personnel.

Within the past year, we have instituted a Continuing Education Program for technical personnel in the department. The initial class was on the subject of Photogrammetric Survey and Design Methods conducted by the extension department of Kansas State University. This year we have two classes, one on the same subject and an additional one on Advanced Highway Design. These courses are financed by the students and instructed by regular instructors from K.S.U. Approximately 35 men are in the design course and 20 in the photogrammetry course, some of which are members of consultant firms and engineering organizations other than the highway commission.

The principal responsibility for

Highlights of the Kansas Program to Upgrade Field Control

Objectives: to provide better personnel and to keep construction practice up-to-date.

Problems: to retain competent personnel, and meet opposition to changes in long-standing practices.

Winter training schools for construction and materials inspectors, originally held at headquarters, now held in the divisions.

An Undergraduate Program with engineering schools puts 120 men in summer work, leading often to full recruitment after graduation.

An in-service training program (75 weeks) has been an enticement for getting engineers on graduation.

New in Kansas is a Continuing Education Program for technical personnel, aided by the university extension service, with consultant employees eligible to attend.

A clearly-defined "chain of command" and advisory setup ties the division and headquarters staff together, with divisions having primary responsibility for field control.

A technical Board of Review at headquarters meets twice monthly on problems and recommends action when necessary.

A Non-Specification Sub-Committee representing all headquarters functions looks into new materials, products and equipment. It recommends approval or rejection, quickly passes findings to the field.

The department's close tie with the state's two engineering colleges include aptitude tests, annual conference both general and specialized.

A close linkage also exists with the contractor and material associations, some of which maintain university scholarships for engineers.

Conferences are held at start of important projects to acquaint contractors and inspectors with problems and requirements.

job inspection and quality control rests with our division construction personnel. Responsibility for quality control and inspection of materials produced at commercial plants is assigned to our Headquarters Materials Department. Materials produced on the job sites are controlled by the division personnel.

In each of our six divisions, we maintain a division materials engineer to exercise general supervision of materials quality control, mixture design, and related problems. We also maintain a division construction engineer who is responsible for the supervision of the construction control in his division. In three of the six divisions, we have added another division construction engineer in the past two years to accommodate the expanded construction program in these areas.

The division personnel have available to them the services of a number of staff engineers from the headquarters departments of Construction, Design, Materials and Research. We maintain a general construction engineer in our Construction Department and specialists on soils and materials control in our Materials Department. Geologists from the Design Department and special staff engineers from our Research Department are also available to our division personnel. The staff people are concerned with uniform interpretation of the specifications, providing assistance to the field personnel on special problems of any nature, and the introduction of new methods and materials when such events occur.

In headquarters, we have established a Technical Board of Review on which each major engineering department of the commission is represented. The Board meets twice a month and any technical problem may be brought before it for discussion and resolution. Problems connected with job inspection and quality control are frequently reviewed by the Board, and conclusions are referred to the appropriate department for any action that may be necessary.

We have also established a Sub-Committee of the Board of Review

for Consideration of Non-Specification Items. The departments represented on this Sub-Committee are Design, Construction, Materials, Maintenance, Research and the Highway Engineer's Office. This committee considers any request received from the producers of new materials or manufactured devices and recommends approval or rejection to the board. This procedure expedites the handling of such requests, provides the department with the viewpoint of all the departments represented, and the conclusions reached can be quickly disseminated to field personnel.

Our Research Department is assigned the responsibility of providing technical information service on job inspection, materials quality control and other technical services to all field personnel.

We have enjoyed excellent relations with the two state engineering schools, Kansas State University and Kansas University, for many years. The staffs of the two institutions have actively supported and contributed to our general program.

In connection with the undergraduate training school, the applicants for this program are screened by aptitude tests conducted at each of the two schools. Those who pass the initial test and are accepted for the program are expected to enroll in one or the other of the two institutions and eventually graduate from the civil engineering schools.

Each year a Highway Engineering Conference is held at Kansas State University sponsored jointly by the University, State Highway Commission, and the State Association of County Engineers. The conference is attended by all of our field personnel down to the positions of Resident Engineer and Principal Inspector, our headquarters personnel, and many city and county engineers. The conference program is in the nature of a short course of highway engineering developments including items on job inspection and quality control. Kansas State University also supports our Continuing Education Program.

Kansas University holds an annual conference on soils and an annual session on asphalt paving.

Continued on page 121

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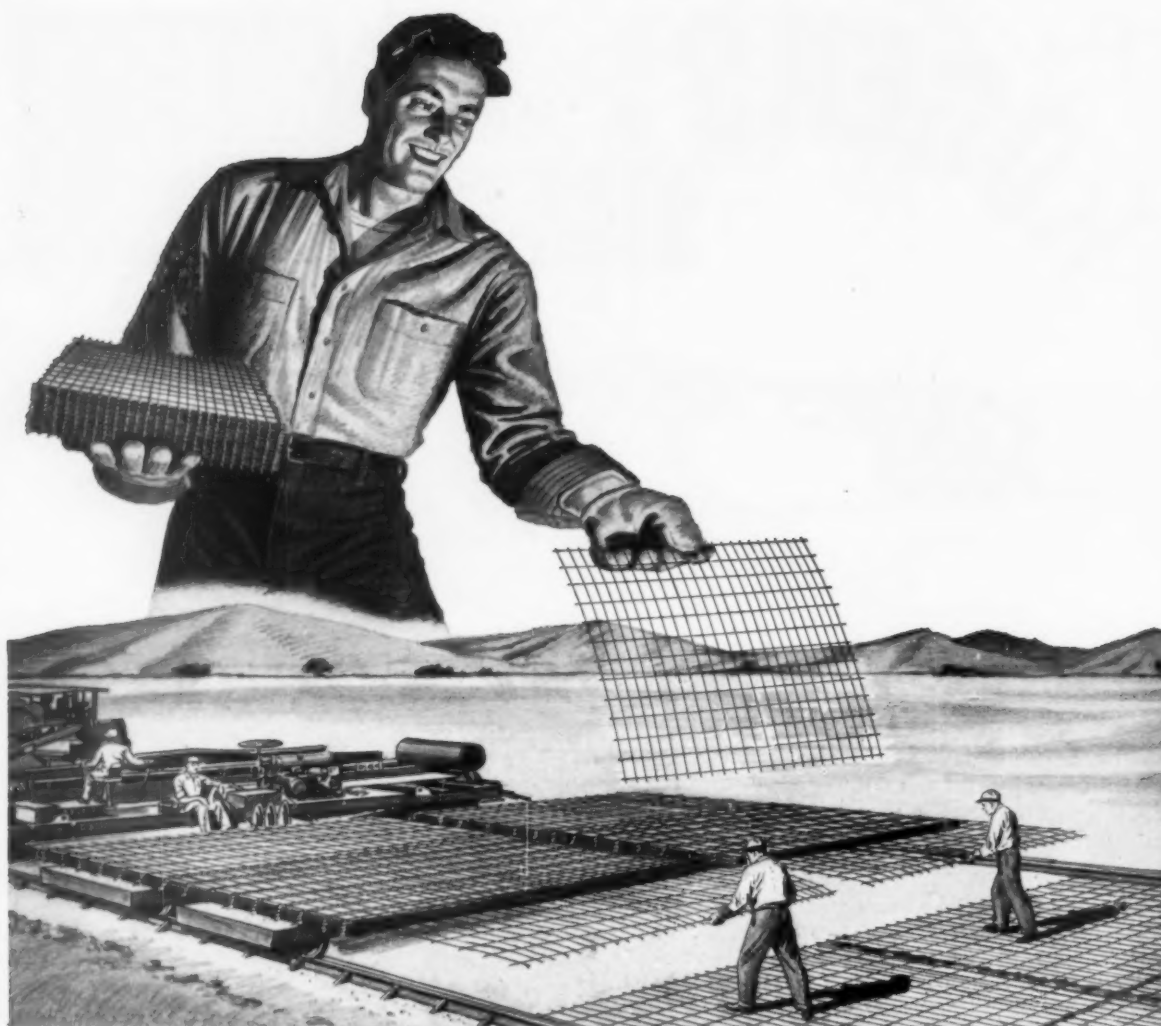
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ROADS AND STREETS, December, 1959

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Annual conference—construction and materials engineers and inspectors, Division 5—Hutchinson, Kansas, February, 1959 — directed by headquarters and division staff engineers.



GETTING GOOD CONSTRUCTION

Continued from page 118

The paving conference is sponsored jointly by the Asphalt Paving Contractors, the University of Kansas, and the Highway Commission. The University also cooperates with the commission and the Kansas Limestone Producers' Association to hold a conference program of interest to engineers every other year. All of these conferences are in the nature of short courses on subjects related to highway engineering, job inspection and quality control.

In addition to these activities, the department and the two engineering schools have always maintained a close and cordial relationship with respect to exchanging information, conducting research projects, recruitment of personnel and other items of interest to the commission and the schools.

And we enjoy very excellent re-

lationships here in this state with the contractor associations and the materials producers groups. The asphalt contractors' and the limestone producer associations join in sponsoring the Kansas University conferences. Joint committees are maintained with the Kansas Contractors' Association (the local chapter of the AGC), the Kansas Asphalt Contractors' Association, the Kansas Ready-Mix Concrete Producers' Association, and the Kansas Limestone Producers' Association. These committees do not meet on any set schedule but are available when needed, and several meetings are held throughout each year. Meetings are also held when necessary with the state's cement producers, of which there are six; and with the asphalt producers, of which there are ten. Within the

past six months, one of the asphalt producers has made available a \$2,500 annual scholarship at Kansas State University to finance a graduate student in some activity associated with research on asphalt paving. The Kansas Contractors' Association has made \$500 annual scholarships available for civil engineering students at each of the two schools.

With the inauguration of the expanded highway program, we have instituted pre-construction conferences for the purpose of acquainting the contractors and engineering personnel assigned to the project with the details of the work. This is a joint effort between the commission's engineering staff and the members of the Kansas Contractors' Association. We have

Continued on page 132

Delaware's Highway Methods Get Quality Review

Editor's Note: Many little "bolt tightenings," a few major changes, characterize the consultant's recommendations in Delaware's unique program of practice appraisal. Vigilant administration and upgrading of personnel are emphasized, along with changes in some specifications and tests. The following covers details of earthwork and concrete construction, only, as indicative of the explicit scrutiny given various areas of the technology.

The things that affect the quality of highway construction and maintenance were given a "screen analysis" in Delaware recently.

Because the approach used was such an obvious one—yet so seldom tried although applicable in any state—the effort is reviewed here in considerable detail. The following is from a report furnished the Roads and Streets editors by deputy chief engineer William J. Miller.

Delaware's study came about from this thinking: "Let us," reasoned the state highway staff leaders, "ask a qualified, disinterested outside consultant to look at our procedures with fresh eyes—comb over our specifications, tests, administrative and personnel practices, and show us where they think we need to catch up with progress, or simply tighten up on field control."

In April of 1958 this thinking led to acceptance of a proposal by Miller-Warden Associates, Consultants, of Swarthmore, Pennsylvania, to undertake a quality control engineering review. This firm had gained experience in this specialized type of work, having among other things served as quality control as well as project consultants on phases of the Garden State Parkway construction, and later done quality control work for the Illinois Tollway's \$300 million construction program of 1956-58. More recently this firm served the National Bituminous Concrete Association in advising their ambitious Quality Improvement for bituminous concrete (see Roads and Streets, March, 1959).

The Delaware state highway department in engaging the consultant did so with an awareness that its staff was spread thin, due to the rise in

work volume and the continuing difficulty in attracting good personnel.

The study was outlined with the further realization that simply adding personnel would solve nothing unless training, job practices and administrative controls were all geared more tightly. The problem was a dual one—to perfect better internal communication and chain of command, filtering down through field engineers and inspectors, and also to review what the department wanted done on the job.

The consultants put their staff to work during the 1958 working season. As a result of a season of field contact, they helped outline a series of staff conferences through the 1958-59 winter, in which the technology was reviewed all along the line from soils and drainage to paving and maintenance.

Another important feature was a training program designed to increase the depth of technical background of the department's engineers, inspectors and testing personnel. This consisted of twelve lectures and discussion sessions conducted by the consultants, and assisted by industry representatives. During these meetings, sources and processes and characteristics of construction materials were covered, as well as modern construction and testing techniques and the "reason why" of related specification requirements.

Then a formal report with recommendations on quality improvement was tendered to Richard A. Haber, Delaware's state highway department chief engineer. This report, recently released by the Department, made numerous highly specific recom-

mendations on major types of construction and maintenance work in addition to personnel and administration.

Excerpts dealing with the earthwork and concrete paving phase in Delaware's construction practice are given in the following, as example of the thoroughness of the study.

Construction Recommendations

The method of operation was to study first the existing conditions, considering all factors that affect the quality of the completed work. Included were materials and their use, proportioning, handling, testing; contractor conformity with plans and specifications; performance of inspectors and adequacy of inspection procedures. The consultant task force observed deficiencies and discussed them on the job with the senior highway representative present. (Usually inspection trips were made with a representative of the Construction or the Division Office.)

Principal findings and recommendations concerning construction work in progress were:

Excavation and Earthwork

Pretesting subgrade. The specification for proof rolling is clear but certain interpretations have resulted in major modification of the requirements as the work is actually performed. Recommendation: Revise specification to require a 15,000-lb. wheel load and two coverages on interstate and primary roads, a 10,000-lb. wheel load and two coverages on secondary roads and an 8,000-lb. wheel load and two coverages on dirt or farm-to-market roads.

Proper drainage of subgrade. Present standard specifications make the contractor responsible for drainage of the subgrade. The Department has paid for undercutting and backfilling of unstable subgrade that became unstable because the contractor failed to provide proper drainage. Recommendation: Enforce the specification.

Shoulder material: Present practice is to use excavated or borrow soil regardless of quality. Recommendation: Use Select Borrow for the entire shoulder from the bottom of the base to the edge of the shoulder, to provide better drainage and greater stability.

Compaction of embankment: Instances were observed where layer thickness exceeded specification (6 in. loose), where compaction of subgrade was not uniform, and compaction equipment not adequate. Recommendation: Change specification to permit placing embankment in 8 in. loose layers for greater economy. Insist on uniform density. Require reworking and retesting when specified density not obtained.

Portland Cement Concrete

Admixtures: The use of air-entraining agents is

general and is considered beneficial. The use of calcium chloride except during cold weather frequently has made trouble. Recommendation: Prohibit calcium chloride in concrete except when possible ambient temperatures below 40° F are expected after placement. When used, calcium chloride should be in solution form.

Retarders are used for bridge decks and for slip form pavement. Retarders are beneficial in long placements such as continuous spans, precast beams and some footings. Recommendation: Retarder quantity should be adjusted to control setting time, and the same proportion should not be used for the entire placement. For short slabs and slip form concrete there is little evidence of benefit and therefore, retarders should not be used in this work. In any case limit retarder use to hot weather.

Quantity of Cement

Base Course: The use of 1.5 bbl. of cement per cu. yd. gives concrete of higher quality than needed for this work. Recommendation: Reduce quantity to 1.25 bbl. per cu. yd. (Recommendation adopted August 7, 1958.)

Patching: The use of 1.72 bbl. of cement per cu. yd. gives concrete of higher quality than needed. Recommendation: Reduce to 1.5 bbl. (Adopted August 7, 1958, except for heavy traffic.)

Extra Cement: Many instances were observed



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where extra cement was used in areas where the pavement could not be opened to traffic early. Recommendation: Use extra cement *only* in those areas where pavement must be opened early. Open to traffic when flexural strength of 450 psi is attained.

Fine Aggregate:

Specifications. These specifications require 28 percent passing 50 sieve; no range or tolerance being set. Recommendation: Revise to provide practical limits. ASTM C-33-55T is suggested.

Gradations: Analysis show that most of the commercial sources furnish well graded sand, but one plant shows a range of 2.94 to 3.56 fineness modulus. Recommendation: Require producer to adjust the gradation for more fines.

Moisture: Many batching plants do not have equipment for moisture determination. Recommendation: Require plants to furnish suitable testing equipment for this purpose, and preferably automatic equipment.

Handling procedure: Sand at one plant is conveyed directly from the barge to the bin, and this procedure often results in extreme moisture content variations. Recommendation: Develop a handling procedure to maintain reasonably constant moisture in the bins.

Proportioning: Many mixes appear to be oversanded when compared with proportions determined by the ACI Method. Present specifications do not provide much variation in the cement factors for concrete for different types of construction. These conditions led to an investigation of the use of several "classes" of concrete. (Subject of special report to the department.) Considerable savings appear possible by use of mixtures varied to suit particular types of construction.

Miscellaneous Practices:

Numerous small details of construction that could be improved have been observed and brought to the attention of inspectors at different times. Some of these questionable practices have been corrected, others still occur. Several of major importance which still need attention are:

Finishing subgrade: The general practice is to finish the subgrade for concrete pavement irregularly and below grade before placing forms. This has often resulted in the contractor placing forms on mounds of soil 2 to 6 in. high at approximately the same width as the base of the form and poorly compacted. This has resulted in undue movement of forms during placing and finishing concrete, and often in a poor riding surface.

Recommendation: Require that the entire width of the subgrade be compacted and finished to grade or slightly above before forms are placed. This will eliminate another objectionable practice of filling

between forms and compacting with inadequate equipment.

Placing wire mesh: Many instances have been observed of improper placing of wire mesh reinforcing in concrete pavement, due chiefly to uneven strike-off of the first layer of concrete. Variation of 1 to 7 in. noted. Recommendation: Insist that the concrete be struck-off uniformly so the mesh can be placed at the depth specified over the entire area.

Operation of finishing machine: Several instances have been observed of using the finishing machine improperly, such as using one screed and one pass rather than two screeds and two passes. Recommendation: Use mechanical finishing to the maximum in order to reduce labor costs and obtain a smoother pavement.

Water in finishing: In some instances finishers have been observed sprinkling water on top of concrete to make finishing easier. This is poor practice as it often causes scaling. Recommendation: Enforce present specifications.

Longitudinal floats: Longitudinal floats, either mechanical or hand operated, have not been used. Proper use of this equipment would give a better riding surface. The surface of the concrete is not generally checked with a straightedge. Recommendation: Proper use of a longitudinal float and straightedge would aid in obtaining better riding surfaces.

Honeycomb on edges: Considerable honeycomb concrete has been found along the edges of concrete pavement, curbs, gutters and sidewalks. Recommendation: Specify vibration along forms for concrete pavement, curbs, gutters, and sidewalks, as well as for structures, and adjacent to old concrete for patches.

Curing: Curing with paper or by membrane is often inadequate along edges after forms are removed. Recommendation: Enforce specifications and insist on an adequate seal.

Field Testing:

Field testing consisting of slump, air content by the pressure method, and cylinders for compressive strength are made by inspectors from the Division of Tests. Their techniques are generally good but it appears that more attention should be given to adequate curing of field specimens. The use of beams (flexural test) rather than cylinders would give more realistic information for concrete pavement.

Compressive strength: A statistical analysis was made of compressive strengths of concrete specimens for several contracts, selected at random and dating back to 1955. Average strengths are lower than expected for the cement content used. The standard deviation was large due to the extremes of high and low breaks. The co-efficient of variation was from 4.8% to 21.4%, but averaged about 10.9%. Variations up to 10% are considered good control.

New Federal Act Permits Secondary Boycotts

HEAVERY construction contractors may be faced by secondary boycotts. One section of the Kennedy-Landrum Act permits these boycotts of work at construction sites if union contractors are involved. But boycotts of materials will be illegal.

For heavy construction contractors this section of the Act and the section permitting pre-hire contracts are probably the most important. It is these sections that will most alter labor relations in the construction industry.

The section on secondary boycotts is the first in Federal law to recognize the secondary boycott as a legitimate union weapon. Actually the section was written to ban all secondary boycotts *except* some types in the construction and garment industries.

This section says in effect that should a contractor agree to union secondary boycotts of work at construction sites, then secondary boycotts of work are legal. The section would also allow these boycotts at alteration, maintenance, and repair sites.

In practice, unions will probably negotiate for contractor-agreement in advance. Contractors will be asked to sign agreements giving up the right to discipline employees who refuse to work with employees of other employers whom the union brands as "non-union."

Pre-hire agreements for the first time since passage of the Taft-Hartley Act will become legal in the construction industry. A pre-hire agreement is one between an employer and a union made before the employer hires a man.

The section on pre-hire contracts also permits union contracts that:

- (1) Require union membership after seven days on the job. (The minimum had been 30 days.)
- (2) Require the employer to notify the union of job openings and permit the union to refer qualified applicants.
- (3) Set training, experience, and length of service priorities in hiring.

Other sections of the Act that will affect electrical contractors are:

- (1) Requirement of employer reports. Employers must report to the Secretary of Labor: loans and payments to union officers; and payments to interfere with, support, or spy on a labor union whether made directly to an employee or indirectly through labor relations consultants.

These reports become public information. Any person who fails to make complete reports or falsifies is subject to a maximum sentence of a year in jail and a \$10,000 fine. The same penalty applies to falsifying, concealing, or destroying books and records.

- (2) Ban on organization, recognition, and adver-

tising picketing. If these types of picketing cause a work stoppage or stop delivery and pick-up of materials, they can be banned after 30 days. The Labor Board would hold an election, and if the union lost, order it to pull off its pickets.

(3) Wiping out of the "no-man's land." State courts and labor boards can act in areas of interstate commerce in which because of the small effect on commerce, the National Labor Relations Board had refused to act and the U.S. Supreme Court had refused to let states act, thus eliminating a "no-man's land" without labor law.

(4) A ban on extortion picketing. (The Hobbs Act makes union extortion a Federal offense. This section merely lets the Labor Board get a quick injunction to stop picketing.)

(5) A ban on unloading fees. It will be illegal for union officers to demand fees before permitting unloading of material from trucks in interstate commerce.

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Contracting Management

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Plan . . . and Keep Your Shirt

Every contractor who works in road construction is faced with the problem of determining how low he can bid a job as observed by Caterpillar Tractor Co. Every highway agency uses the competitive bid to obtain the greatest value for the lowest possible outlay of public funds.

The low bidder is normally the successful bidder, but that doesn't necessarily mean he's a successful contractor; he may have underestimated his costs, and bid the job at little or no profit.

Every contractor hates to lose a bid, but it's not good business to win a bid and lose your shirt in the bargain, since profit is the lifeblood of any business. Given an adequate return on capital investments, any company can continue to prosper and grow. Failure to realize a profit, however, can stunt company growth or force declaration of bankruptcy.

It's important, of course, that every contractor be able to determine at the end of the year whether he realized a profit or suffered a loss. Even more impor-

tant, however, is the ability to forecast what the year-end review will show—the ability to *plan* for profit. This means that he must be able to estimate accurately just how low he can bid on every job and still break even. The difference between this “break-even” figure and the amount of the bid determines how much profit can be expected.

What is involved? There are many things which must be considered in determining this “break-even” point. Direct machine expenses for depreciation, fuel, lubrication and repairs, plus cost of labor for operating the machine are, of course the most obvious. Equally important, however, are overhead expenses—cost of office space and supplies; transportation equipment such as trucks and lowboys; cost of insurance, licenses and taxes; office and supervisory personnel wages; and numerous other incidental costs of running a business.

Since the money-earning machines are the company's major source of revenue, they must be made to not only support themselves, but to earn enough to cover overhead costs and provide a profit.

Records are important. For the purpose of ascertaining hourly owning and operating costs, it is best if a complete record showing all fuel, oil and repair costs is kept on each piece of equipment. Lacking complete records, however, owners may obtain assistance in estimating average cost figures from equipment dealers for their particular machines.

Hourly owning and operating costs must include an allowance for depreciation, plus the direct costs for fuel, oil and repairs, as well as the operator's hourly wages. For the purpose of this article, we will assume that the equipment will depreciate 100 per cent in five years, or 10,000 hours of operation under average condition.

Using a Caterpillar D8 Series H Tractor (direct drive) as an example, let's see how these hourly owning and operating costs are arrived at.

Price of the D8 Tractor with standard equipment is approximately \$31,000.

Interest, insurance and taxes could cost approximately 3¢ per \$1,000 of price per hour. The tractor might consume approximately 7.6 gal. of fuel, 8/100 gal. of crankcase lube oil, 5/100 gal. of oil clutch & common sump lube oil, and 2/100 lb. of final drive lube oil per hour. Repairs could cost approximately 90 per cent of the hourly depreciation figure per hour of operation.

With all these figures in mind, cost per hour under average conditions could be approximately as outlined below. However, as you know, costs will differ from area to area. You can figure your own in the right hand column as indicated in the accompanying table.

Street contracting work requires that the tractor be equipped with certain attachments and equipment. Let's assume that this D8 is equipped with a

straight bulldozer, a No. 463 Scraper (18 cu. yd. struck capacity), and a double-drum cable control for operating the dozer and scraper.

Average hourly owning and operating costs for these attachments, obtained in the same manner as for the tractor will be approximately:

Straight bulldozer—	\$.86	....
No. 463 Scraper—	3.39	....
Cable Control—	.55	....
	<hr/> \$4.80	....

Thus, merely owning and operating this combination requires that to break even the contractor charge a total of:

Tractor O&O Costs	\$11.15	....
Equipment and Attachment O&O Costs	4.80	....
Total	<hr/> \$15.95	....

There's still more! But, wait a minute! We haven't even touched on the overhead costs. Wages for office and supervisory personnel, rental of office space, purchase of office supplies, transportation of equipment to the job site, maintenance of an equipment yard and repair shop, and provision for operation of any other vehicles used in the business must be figured in, too.

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Remember, too, that in computing money paid out in wages, such fringe benefits as Social Security, insurance plans and any other expenditures necessary to keep employees on the job must be figured in.

The average contractor probably uses two or three tractors, including two in the D8 class. For the sake of simplicity, we will assume that the equipment fleet we are speaking of consists of three D8-No. 463 machines working approximately 1,500 hours per year. Overhead expenses for an operation of this size might well total \$10,000 per year. In other words, to cover overhead expenses, the machines must earn approximately:

$$\frac{\$10,000 \text{ (overhead)}}{1,500 \text{ (hrs. operated)}} = \$6.66 \text{ per hour}$$

Divide this figure by three, and each machine must earn an additional \$2.22 per hour to cover overhead expenses.

Thus, the total hourly minimum rate that each machine must earn if the owner is to break even would be:

	Example Costs	Your Costs
Tractor owning and operating costs	\$11.15	....
Attachment and equipment owning and operating costs	4.80	....
Overhead	2.22	....
	<hr/> \$18.17	<hr/>

Overhead costs can be spread out thinner as the number of hours worked during the year increases, thus putting the contractor in a more competitive position for bidding.

Remember also that costs for permits, plans and other expenses directly attributable to each job must be figured in the bid price.

All that remains after ascertaining the required hourly rate for machines is to decide how much time the job will require and add on the profit (a percentage of the total) to arrive at a final bid price.

Now, let's review the important factors used in establishing the minimum hourly rate:

1. Keep cost records or estimate hourly owning and operating costs on each machine.
2. Ascertain the cost of all supporting equipment and plant, plus wages for office, supervisory and maintenance personnel (overhead) and work out an hourly cost basis.
3. Plan to keep equipment working to spread out the overhead. (Don't be afraid to advertise.)
4. Make sure to add in direct expenses, such as special permits, plans, etc. for each particular job.
5. Plan for profit.

IN VIRGINIA A STATE-WIDE HIGHWAY PUBLIC INFORMATION PROGRAM is being set up. Known as the "4-C" plan, it will be "Comprehensive, Coordinated, Consistent and Continuing." Its supporters will be a committee of state highway officials, equipment suppliers, material producers and publishers.

Figuring Hourly Tractor Cost

	Example Costs	Your Costs
Owning Cost:		
Depreciation—\$31,000 (price) ÷ 10,000 (hours)	\$3.10	.....
Interest, insurance, taxes—3¢/\$1,000 of cost	.93	.....
Total	<hr/> \$4.03	<hr/>
Operating Cost:		
Fuel and Lubricants—		
Diesel fuel—7.6 (gph) x 15 (¢/gal.)	\$1.14	.....
Gasoline—(for starting and cleaning)	.03	.....
Lube oil, engine—.08 (gph) x 100 (¢/gal.)	.08	.....
Oil clutch & common sump—.05 (gph x 100 (¢/gal.)	.05	.....
Final drives—.02 (gph) x 80 (¢/gal.)	.02	.....
Filters—	.01	.....
Grease	***	.....
Repairs—.90 x \$3.10 (hourly depreciation)	2.79	.....
Total	<hr/> \$4.12	<hr/>
*** negligible		
Operator's wages	3.00	.....
Total Owning and Operating Costs for Tractor	<hr/> \$11.15	<hr/>

To Count Traffic by Radar

The planning division of the Pennsylvania department of highways has recommended replacement of electric eye detectors at their 55 permanent traffic counting stations. This recommendation was based on a test report submitted July, 1959, by planning engineer Paul D. Muffley.

With the influx of modern sports and conventional cars having low silhouettes and increased glass areas, the electric eye detector has not produced the high degree of accuracy required of automatic counting stations. To correct this condition, the planning division tested two other detection methods.

Treadles, which transmit axle impulses, were tested at eight locations. Accuracy of count appeared acceptable as compared with manual checks. However, because of significant but irregular truck traffic reliable conversion factors of axle to vehicle counts could not be obtained. Long-term manual checks were impractical and financially impossible.

A radar detector was put through a test period of several weeks, adjacent to one of the treadle test sites on the M. Harvey Taylor Bridge in Harrisburg. For the major portion of the test period the radar coverage was one lane, in accordance with the manufacturer's recommendations. However, an attempt was also made to cover two traffic lanes with a single radar unit and also to investigate the possibility of detecting only high vehicles by adjustment of the radar beam. While the results of the two lane coverage of the high vehicle tests were not satisfactory, the single-lane installation proved the accuracy of the radar count to be superior to the treadle count, both checked against manual count. For a two-day period 7:00 a.m. to 6:00 p.m., the radar accuracy was within 0.1 percent while the treadle accuracy was within 3.2 percent.

Aside from accuracy of count, another factor of great importance to the department is the inconvenience to traffic during installation and servicing of traffic counting units. Treadle installation requires lane blockage for at least three days as compared to interruption of traffic for about 30 minutes for radar installation.

Installation costs were compared and reported for a four lane station, including recording counters, summarized as follows:

	Radar	Treadle
Material	\$4,040.87	\$2,979.37
Labor	250.00	930.18
Total	\$4,290.87	\$3,909.55

Based on both the accuracy test and the cost comparisons, the planning division is recommending that the state department take steps to replace exist-

ing electric eye counting stations by radar detectors, and to use this equipment for any future installations.

Pike Guard Rail Issue Raised Again

A bill to require the Pennsylvania Turnpike Commission to erect medial barriers along the full length of its toll superhighway was reported to the Pennsylvania House of Representatives recently by its motor vehicles committee. Similar to proposals rejected twice previously, the measure would require 15 miles of guard rail each year until the entire road is thus equipped. There now are 50 miles of barriers along the 470-mile turnpike system.

Opposition to the barriers is based both on failure of the legislature to include money for the work in the bills. Also on the contention their safety feature is of questionable merit. Opponents say the barriers create more accidents than they prevent.


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Structure backfill and hard-to-get-at places usually call for hand equipment—and somewhat closer inspection control. Seen here on A. S. Horner project are, left a GVR100C Wacker and, right, a Vibro Plus tamping unit.

END RESULTS

Continued from page 78

determined by laboratory tests. This quantity will vary with the soil classification and the natural moisture content. Estimate of the quantity of water to be used is shown on Plans. However, the quantity of water to be used may be varied on order of the Engineer to meet conditions brought about by storms, drouth, or other causes. The sprinkling shall be done in such a way that areas of dry material alternated by areas of saturated soil or pools of water will be voided. The Contractor will be required to supply and use equipment which will insure uniform dispersion of water through the soil mass and which will maintain shape of the grade during construction. If excavated materials contain excess moisture, the Contractor will be required to reduce the moisture content as provided in

par. 15.1.3 of these Standard Specifications.

Item 17.2.3.3. Concurrently with the wetting operations, the material shall be uniformly compacted.

Item 17.2.4.1. The Contractor may use *any type of compaction equipment he deems necessary to obtain the specified density.* (Italics ours. Author). Compaction equipment shall be construed to include trucks, tractors, bulldozers and all other pieces of construction equipment used in excavating, transporting, placing and spreading material in addition to any rollers or vibrators used. Each layer of material shall be compacted by routing the equipment over the entire width in such a manner that uniform densities will result. Equipment used for compaction of the upper 8 inches of the subgrade shall be such as to leave a smooth surface, free of compaction planes.

Item 17.2.4.2. Regardless of the equipment used for compaction,

the rate of placing embankment and other materials shall be coordinated with the compaction operations so that the required density is obtained.

Item 17.3.2. The quantity of water to be paid for under this Item shall be the number of thousand U.S. gallons used in accordance with the foregoing requirements. Measurement of water used on the Roadway may be made in the vehicle at point of delivery or by meter measurement. Where excavation materials are wetted at the source, the Engineer may pay the theoretical quantity of water computed as the difference between in situ moisture and moisture at the time of excavation, provided that the moisture at the time of excavation is not in excess of that necessary to optimum compaction. Water added on the Roadway to preserve material in a state necessary for optimum compaction will be paid for.

Item 17.4.1. Compaction of embankments shall be paid for at the Contract unit price per cubic yard for "Compaction," which price and payment shall be full compensation for all compaction necessary to obtain the required densities and for furnishing all necessary compaction equipment, and for scarifying, aeration, windrowing, harrowing, mixing spreading, blading and finishing involved in producing the compacted underlying material and embankments with a finished surface.

Wyoming Specifications. The essence of these specifications is contained in the following excerpt from a letter dated July 1, 1959, addressed to Roads and Streets from M. A. Ver Brugge, assistant state materials engineer, Wyoming highway department.

"We specify as clearly and concisely as possible the end product desired. We do not instruct the contractor what his procedures or methods shall be, nor do we describe or specify the type of equipment he shall use. We have eliminated the words Construction Methods from the subsections and simply refer to the desired end product description section as Construction.

"... Detail reference is not made to the plant, equipment, or procedures. Note also that the words 'as directed by the Engineer' do not appear in this specification. This prevails in all of our new specifications except under extreme conditions where it is unavoidable."

Random excerpts from the latest Wyoming specifications:

Section 202 — Roadway and Drainage Excavation. Clause 202.2 Construction Methods: "... Pre-Irrigation of Excavation Materials: The Contractor may of his own accord, or when it is called for in the bid schedule or on the Plans, pre-irrigate the material in excavation areas prior to placing it in the embankment in accordance with the following or other approved similar procedure.

Excavation areas shall be watered by a sprinkler irrigation method, so controlled and regulated that the material to be taken from the area and placed in embankment shall have a sufficient moisture content

that it can be compacted to the specified density with the use of standard compaction equipment. Excavation areas shall be irrigated until the soil layers for the entire area are moistened to the field carrying capacity of the soil, from the surface to the bottom of the area to be excavated, before any material is removed.

The field carrying capacity of any soil is approximately equivalent to the optimum moisture content for the soil.

In order to insure effective downward movement of the water and to minimize run off, the natural growth on the area to be excavated shall not be removed until all watering of the area has been completed. The time limit for stripping the area shall be subject to the control of the Engineer.

The placing and operation of the sprinkler system shall be such as to adequately water the area without waste of water. Payment will not be allowed for water that has been wasted or otherwise lost through carelessness of the Contractor.

The Contractor shall provide adequate drilling equipment to check the penetration of moisture for the full depth of the excavation.

Water shall be metered with an approved metering device. The Contractor shall furnish the Engineer a certificate showing that the meter has been accurately calibrated just prior to use on the project.*

Section 207 — Embankment. Clause 207.32 (Construction Methods) Placing Embankment: The Contractor shall consolidate each layer of the embankment in the most effective and reasonable manner. He is at liberty to use any type of compaction equipment he deems adequate to obtain the specified density in accordance with these specifications. The rate of placing embankment material shall at all times be coordinated with the watering, mixing and compacting operations in such a manner that compaction to the required density is obtained.

Care shall be exercised in using rollers and special compaction equipment on shoulders and slopes

*See "Prescription: Big-Scale Pre-Wetting, Ripping;" Roads and Streets, October, 1959.

of embankments so that throughout construction they shall conform to the typical section shown on the plans.

207.4 Method of Measurement and Basis of Payment. Embankment shall not be measured for direct payment, but shall be considered a subsidiary item to the performance of work covered by the unit prices bid for Items 202, 203, and 204, provided however, that water applied as provided above will be measured and paid for at the Contract unit price bid, and in accordance with the provisions of Section 224 for "Watering," and compaction performed as required above will be measured and paid for at the Contract unit price bid and in accordance with the provisions of Section 208 for "Embankment Compaction."

Washington Specifications. Washington specifications will not be quoted, but the following excerpt is given from a paper entitled "Control of Embankment Compaction," presented by E. C. Simpson, construction engineer, Washington department of highways, at the 38th WASHO Conference describing their basic attitude:

"With the successful development of the necessary control test procedures, Washington compaction specifications were revised to the 'end-product' type by special provisions in June 1956 and included in the Standard Specifications, which were adopted in July 1957.

"Embankments have been divided into two classes, rock embankments and earth embankments. Rock embankments are those made of materials which contain 10 percent or more by volume of gravel or stone 4 inches or greater in diameter. This division is made because it is extremely difficult to perform accurate density control tests for such coarse materials. In lieu of a specific density requirement, a given amount of rolling with specified roller types is required, which is considered to be adequate to produce the desired compaction.

"All other embankments are classed as earth embankments. Three methods of construction are described in the standard specifica-

tions, one of which is selected by special provision for each contract. Method A, which allows lifts up to 2 ft. in thickness and requires compaction by routing hauling equipment, has been retained for use by sub-agencies and for low-cost secondary roads or projects involving stage construction. Moisture content at the time of compaction is limited to not over 3 percent above optimum. Pay for compaction is incidental to other bid items.

"Method B requires shallow lift construction with each lift being compacted to a specified density. Moisture content at the time of compaction is limited to not over 3 percent above optimum. Ninety percent of the established maximum density must be obtained, except in the top 2 ft. where 95 percent must be obtained.

"Method C is similar to Method B except the moisture content at the time of compaction must be within three percentage points above or below optimum, and the entire embankment must be compacted to at least 95 percent of the established maximum density. Payment for compaction under Method B or Method C is by the cubic yard or compacted embankment. *The contractor may use any compaction method he chooses provided it produces the desired results within a reasonable length of time.*" (Again, italic ours: the Author.)

Idaho Specifications. The Idaho department has gone on an end-result basis in its embankment specifications and is tending this way for other work.

Idaho bid schedules have items for water and excavation but not separately for compaction. This practice affords the bidder an opportunity to include compaction in an excavation item or spread the cost out elsewhere. Soils weighing 110 lb. per cu. ft. and under are simply required to be compacted to 100 percent of straight AASHO density; material over 110 lb., to 95 percent. Excerpting Idaho's latest specification under "Section 210—Embankments:"

210.05 Compaction Equipment. A sufficient number of compacting units shall be provided to efficiently obtain the density requirements specified. The breakdown or other failure of equipment to provide specified compaction requirements shall constitute sufficient cause for the Engineer to order reduction in the placing of embankment material to quantities which can be compacted to specified requirements. The choice of compaction equipment to be used will be left to the Contractor.

• • •

The concluding part of this report next month will touch on test procedures and give job experiences and general conclusions.

Getting Good Construction

Continued from page 121

found that a frank and open discussion of the contract requirements with respect to the job inspection practices and quality control procedures that will be used on the project between our personnel and the contractor's personnel has been very helpful in producing high quality of construction on the job.

Summary: All of the activities are continuing and developing; and although they have been very helpful and successful to a degree, they have not entirely solved our problem. With the construction program as large as it is, we still have occasional jobs where the final product is unsatisfactory due to inadequate job inspection or lapses in the inspection and quality control techniques.

However, in the main, we feel that a very definite improvement has taken place since 1946 and that additional improvements will occur as the results of these various programs become more evident. Certainly this department has no intention of tolerating lax inspection practices or inadequate quality control procedures, but with the program as large as it is, it is almost inevitable that these things occur at times.

Modern Equipment for Cook County's Striping

Though Cook County does not have the job of striping Chicago streets, it still has responsibility for 525 miles of Illinois county roads outside the city. For 1959, the county estimates that their striping chore will require 10,000 gal. of white and 1,500 gal. of yellow paint.

With supervision of streets in rural areas and in dozens of suburban towns, the county highway department renews all painted stripes as often as necessary to keep them clearly visible day and night. On many sections this is an annual task. Fresh striping is also required when a road is resurfaced—some 40 miles a year—or when a seal coat is applied to black top.

Cook County's striper is an M-B

Corporation machine built to the county's specifications. The truck chassis mounts three paint tanks of 700 gal. capacity and a vane type compressor providing 125 cu. ft. of free air per minute. Using one gun, the unit is operated at 7 mph; with

two guns in tandem the speed is 12 mph. The guide is a folding A-frame, bumper mounted.

Larry Mariotti is supervisor of the paint and sign shop of the Cook County highway department.

The M-B striper in use on Cook County roads.



BOARDMAN'S

Progressive Capacity Portable Batch Plants

INCREASE BATCHING CAPACITY FROM 250 to 800 Cu.Yds.-Per-Day
WITHOUT DISCARDING USEFUL EQUIPMENT!

Here's a new idea in batching plant layouts!
Start with BOARDMAN'S PORTABLE
BATCHER—the ideal keystone—and add other
Boardman units, like building blocks, for
added capacity, greater profit. Lightweight
and maneuverable. Boardman's Portable
Batcher has three-beam scale, over and under
indicator and automatic water meter . . . and a
low initial investment!

BATCHING CAPACITY:
250 Cubic Yards-Per-Day

Add Building Block No. 2— BOARDMAN'S
PORTABLE BULK CEMENT SILO, and
capacity increases, labor and cement costs
go down! Highly portable silo stores 350
bbls. bulk cement, features precision scale
and weigh hopper, screw or bucket
elevators.

INCREASED CAPACITY:
350 Cubic Yards-Per-Day

BOARDMAN'S Portable Double-Capacity
OVERHEAD AGGREGATE BIN, Building
Block No. 3, pushes your capacity up to 500
cubic yards-per-day! Crane-loaded, with
2/3-1/3 ratio compartments for 15 tons of sand
and gravel, and optional extension sides for 30
tons. Ruggedly constructed, easy to operate!

INCREASED CAPACITY:
500 Cubic Yards-Per-Day

You achieve the highest capacity of any com-
pletely portable batching plant on the market
today with BOARDMAN'S BATCHING CON-
VEYOR BELTS. Only two men are needed to
produce 800 cubic yards of ready-mix every
day. This plant layout is recommended over the
Overhead Bin layout if a loading crane is not
available.

INCREASED CAPACITY:
800 Cubic Yards-Per-Day



engineered and
manufactured by the

BOARDMAN

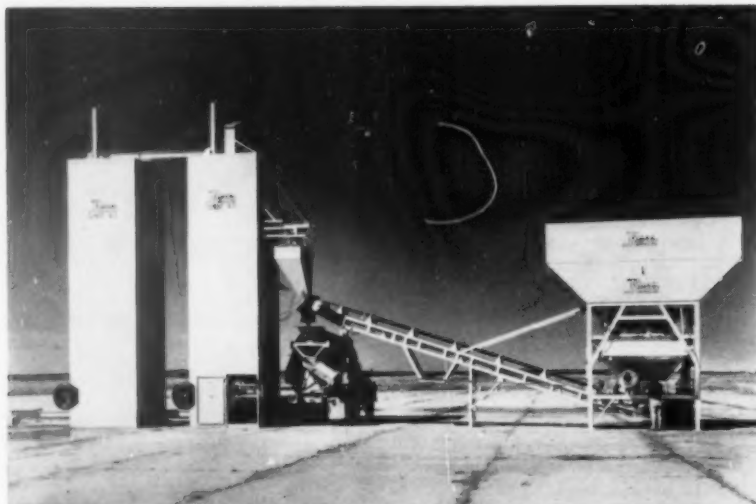
co.

The Boardman Co., Dept. RS
P. O. Box 1152, Oklahoma City
Please rush me your Engineering Reference
& Data Manual showing complete details on
economical Progressive Capacity Batching
with BOARDMAN-Built equipment.

NAME _____
COMPANY _____
ADDRESS & CITY _____

NEW PRODUCTS

Listed here are reviews of new and improved equipment items, selected to aid our readers in purchasing. See reader service numbers on enclosed postcard.*



Ross Portable Concrete Batching Setup with Stationary Capacity.

Portable Batch Plant

A high capacity portable batch plant features portable overhead self-contained aggregate plant with three or four compartments and 60 tons of overhead storage. The unit, known as Ross Porta-Plant, is standardly equipped with a 1½ in. automatic water meter, folding sides for legal highway travel, 15,000 lb. dial scales and complete air operational system on all gates. Basically operated through air manual operation, the plant can be furnished in various stages of automation.

The portable 350-B Bucket Elevator Cement Plant can be augmented by the addition of one or two auxiliary silos. The additional units connected in sequence, boost the cement storage from 350 barrels to 1,100 barrels.

**Ross Porta-Plant, Box 446,
Brownwood, Texas**

For more details circle 101 on
Enclosed Return Postal Card.



B-G Travelling Stabilization Plant

Stabilization Plant

A stabilization mixing plant, which travels on its own trailer-chassis at normal truck speeds, then at the job-site lifts itself hydraulically to operating position in 90 sec-

onds is offered by Barber-Greene Company. The new unit incorporates one of the company's Model 828 mixing plants, which has a capacity in excess of 400 tph depending upon the type of material being mixed. It can handle a wide range

of mineral materials, and an equally wide range of stabilizing agents; calcium chloride, cement, water, emulsified asphalts, etc., according to the company. Mobile mounting is provided by a standard 10-ton "goose-neck" trailer with fifth-wheel hitch. In traveling position, the plant is carried entirely within the standard 8 ft. highway limits and no special permits for its movement are required.

The mixing pugmill unit is hoisted into operation position, hydraulically and is supported by heavy duty structural arms. Locking pins are inserted after full height has been reached and no external guy wires or other bracing are necessary. The operator's platform is reached by a self-folding steel stairway with double handrails. In operating position, there is a 9 ft. 2 in. truck clearance beneath the mixer's double clamshell discharge gates, making a truck pit unnecessary.

Barber-Greene Co., Aurora, Ill.

For more details circle 102 on
Enclosed Return Postal Card.

*To readers outside of the United States—postal rules forbid use of business reply cards outside of the U.S. Please write to us listing the numbers, month and name of magazine, and mail with your name and address to Inquiry Dept., Roads and Streets, 22 W. Maple St., Chicago 10, Ill., U.S.A.



Euclid C-6 Tractor with 211 net hp.

211-HP Tractor

The Euclid Division of General Motors has announced the new Model C-6 tractor with "Torqmatic" Drive. This feature consists of a torque converter and semi-automatic transmission that eliminates the master clutch. Changes from one of the three forward speed ranges to another and from forward to reverse and back again are made under full engine power. Cooling system is rear mounted which is said to add to good operator visibility because the nose guard does not have to accommodate the fan and radiator.

Front equalizer bar gives both vertical and lateral support without cross braces; constant track alignment is maintained under all working conditions, the manufacturer states. Major component parts are placed for easy servicing; sprockets and final drives can be serviced or replaced without removing roller frames.

Standard track shoes are 22 in. wide, track gauge is 78 in. and total

ground contact area is 5,069 sq. in. Overall dimensions of the trailer are: 178 in. long, 100 in. wide, and 96 3/4 in. high. Bare operating weight is 42,000 lb., top speed forward and reverse is 7.9 mph.

Euclid Advertising Dept., Euclid Division, General Motors Corp., Cleveland 17, Ohio.

For more details circle 103 on Enclosed Return Postal Card

Aggregate Hopper

A new aggregate hopper for bulk plant operation that can unload while underway has been introduced by the Fruehauf Trailer Company. The new hoppers, in train operation, allow up to one ton extra payload to aggregate haulers. They have 40 in. x 50 in. air operated clam shell gates, electrically operated by the driver using cab controls. The gates can also be operated from the side of trailers.

The hoppers handle sand or gravel mixtures, and in train operation have a payload capacity of up



Fruehauf Aggregate Hopper

to 28 tons when 76,800 lb. gross is allowed. Wheels of the new units are made of "Hi-Ten" steel, are equipped with 12 ply tires and 16 1/2 x 7 in. air brakes. Both semi and 4-wheeler have a capacity of 300 cu. ft. with interliners of aluminum.

Fruehauf Trailer Company, 5137 South Boyle, Los Angeles 58, Calif.

For more details circle 104 on Enclosed Return Postal Card

Motor Crane

The Thew Shovel Company announces a 65-ton Lorain Model MC-760 Moto-Crane on an all new carrier. The 8 ft. by 4 ft. unit contains many Lorain features such as "Power-Set", outriggers, "Shear-Ball" connection and square-tubular-chord boom.

The carrier is constructed with a sturdy new welded box-section chassis frame 22 inches deep which is said to virtually eliminate deflection or torsion under heavy loads. The 230 in. wheel base provides 14 feet between the second and third axles; and the unit travels up to 37.6 mph and has air



Moto-Crane Mc-760

brakes on all 8 wheels. Front axles are mounted with solid equalizer beams to produce higher "on rubber" capacities. The two rear driving axles are double reduction type with high traction differentials and final reduction is through planetary wheel hubs which relieve the power train of excessive loads and shocks. All 4 outriggers can be extended to working position in less than 60 seconds. They automatically adjust to rough terrain, level the machine, are held in position by automatic wedge locks free of hydraulics.

The Thew Shovel Company, Lorain, Ohio.

For more details circle 105 on Enclosed Return Postal Card

Snow Fences

A lightweight, durable new tape-like filament for snow fences has been developed by the Dow Chemical Company. The woven fabric fences of "Rovana" (saran micro-tape) combine ease of installation and low storage and handling costs, the maker states. Fences tested during winter 1958-59 were constructed of two bands of 12-in.

wide fabric placed 12 inches apart. Posts were 12 ft. apart and the bands were tied to conventional stakes. Ice sheets over 1/8-in. thick are said to have had no sagging effect on the fence, while at the same time, the fence created the desired amount of swirl. Additional installations for sand barriers and erosion control are now being tested.

Textile Fibers Department, Product Information Service, The Dow Chemical Company, 162 Water St., Midland, Mich.

For more details circle 106 on Enclosed Return Postal Card.

Crawler Tractor Control

A new master control that reduces the job of driving crawler tractors to a matter of pushing a single control stick forward, backward, or to the side has been developed by John Deere engineers.

The new single-stick control activates hydraulics to perform the various steps of clutching, braking, steering, and shifting for forward and reverse travel. The control, called "Pilot-Touch," will be offered as optional equipment on John Deere "440" Industrial Crawlers.



Crawler Tractor Control

Only slight pressure is required on the control stick. Its movement brings the proper hydraulic controls into action to do the work of braking, clutching, shifting from forward to reverse and other steering work. Since the Crawler can be operated with one hand, the other hand is freed for full-time control of loaders, bulldozers, or other working equipment being used with the crawler.

John Deere Industrial Division, Deere & Co., Moline, Ill.

For more details circle 107 on Enclosed Return Postal Card.

Eight-Batch Trailer

A new 8-batch trailer with remote-controlled hydraulic trippers has been introduced by Galion Allsteel Body Company. The hydraulically-operated batch trippers, mounted on the body side, provide instantaneous release of



Galion 8-Batch Trailer

batches from a remote control panel inside the cab. This eliminates the need for a "skip boy" to tend the tripping manually.

Other innovations include: Hydraulically operated "levelizers" on rear tandems to minimize the danger of tipping when body is in raised position; and a special 30 in. tailgate to guard against dumping damage to tailgate and paving skip.

Galion Allsteel Body Company, Galion, Ohio.

For more details circle 108 on Enclosed Return Postal Card.

Push Plate Cylinder

The shock absorbing action of the Pushin' Cushin' Cylinder is said to cushion with no resistance on contact and then control the load to a smooth stop before reaching the end of its inward stroke. In returning to the extended position, it has free travel to within the last three inches; then it is cushioned to a slow stop.

The quick return action of the cylinder keeps the push plate in a shock



Pushin' Cushin' Cylinder

absorbing position at all times. For example, should the scraper pull away from the pusher, the push plate snaps out to reload position ready for recontact and to absorb the shock, whether the scraper is 1 inch or 10 ft. away. The multiple action cushion of the hydraulic cylinder allows the pusher tractor the freedom of shifting up or down, during the loading or unloading operation, without shock, the manufacturer states.

Pushin' Cushin', Inc., Box 107, Perry, Kansas.

For more details circle 109 on Enclosed Return Postal Card.

Nitrate Transport

With the new Baughman PE-6 ammonium nitrate transport, it is now possible to carry this chemical in bulk and mix with oil later on the site. Carrying the ammonium nitrate in this form, the manufacturer points out, permits the user to transport it at the same rate as if the chemical were to be used for fertilizer while conforming with all ICC regulations.

The built-in body mixer pre-measures and adds the necessary oil to the nitrate as the body is unloaded. There



Baughman PE-6 Transport

is no dangerous mixed materials to endanger men or equipment the manufacturer states. The mixer can be set to add 5 to 6 percent oil which is carried in tanks large enough to insure the treatment of a complete payload. A counter determines the exact number of pounds used per charging hole. The body is of a new parabolic type tank. It is constructed in 4 ft. compartments with a loading hatch over each; 2-ft. compartments are optional.

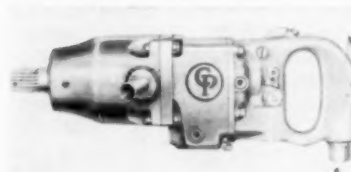
Baughman Manufacturing Company, Jerseyville, Ill.

For more details circle 110 on Enclosed Return Postal Card.

Impact Wrench

A new torque control, reversible impact wrench is announced by the Chicago Pneumatic Tool Company. This unit is said to be capable of delivering up to 1,000 lb. of controlled torque output with accuracy great enough to eliminate hand torque follow-up or sampling for uniformity.

The tool and its rotary motor are in



Chicago Impact Wrench

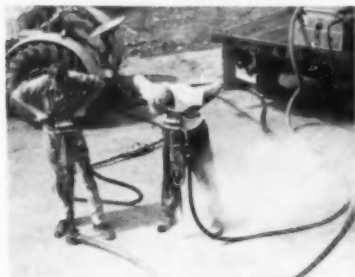
a 19-in. frame; torque control mechanism is totally enclosed, eliminating the need for extensions and adapters. The wrench can be used for torquing 1 in., 1 1/8 in. and 1 1/4 in. high tensile bolts as well as standard impact wrench duties. The wrench has 1 1/2 in. bolt capacity.

Chicago Pneumatic Tool Company, 6 E. 44th St., New York 17, N. Y.

For more details circle 111 on Enclosed Return Postal Card.

Dust Collecting System

A newly developed dust collecting system for use with hand held sinker drills is now being offered by Le Roi Division. It can be used with any brand of rock drills, according to the manufacturer. Dust and cuttings are trapped by a collar that fits around the drill steel and are "inhaled" through a connecting hose to a Le Roi DK280 dust collecting tank. In addition to eliminating dust as a health hazard,



Le Roi Dust Collecting System

the collecting system increases air tool operator comfort and efficiency, the manufacturer states. The dust collecting tank can be mounted on any compressor carrying truck, portable compressor or Le Roi's combination tractor-compressor, the Tractair. The unit has a 23 in. wide, 16 in. long and 7 in. deep drawer that pulls out easily for disposal of dust and cuttings.

Sales Promotion Dept., Le Roi Division, Westinghouse Air Brake Company, Milwaukee 1, Wis.

For more details circle 112 on Enclosed Return Postal Card.

Transits and Levels

Path surveying instruments, a new line of surveying transits and levels, are now being distributed in the United States by Charles Bruning Manufacturing Company, Inc. The line includes 4 in. and 6 in. transits, transit levels, dumpy levels, eye levels, tilting levels, and pocket levels. The instruments use Japanese lenses to provide superior definition of viewed objects, distinct magnification of images, and resolute accuracy on targets, the distributor states.

For protection during transport, transits and levels are securely fastened



Path Surveying Instruments

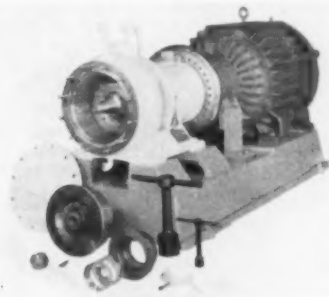
to the floor of sturdy wood carrying cases. Instrument adjustment tools, a plumb bob, magnifying glass and sunshade are standard equipment and are firmly fixed in carrying case brackets.

Charles Bruning Company, Inc., 1800 West Central Road, Mount Prospect, Ill.

For more details circle 113 on Enclosed Return Postal Card.

Colloid Mills

Colloid mill units with new design features from 1 hp to 125 hp construction of stainless steel are available from Chemicolloid Laboratories, Inc. The units utilize the Charlotte principle which combines the forces of hydraulic shear, centrifugal action and impingement of the product between the



Chemicolloid's Colloid Mills

grooved rotor and stator which is said to produce fine dispersions and uniform emulsions.

Continuous production through a closed system is possible because the mill does not require free gravity discharge. Units in sizes from small pilot models to those with capacities up to 7,000 gph are available.

Chemicolloid Laboratories, Inc., 55 Hericks Rd., Garden City Park, L. I., N. Y.

For more details circle 114 on Enclosed Return Postal Card.

Supplemental Speaker

Motorola has introduced a 15-watt speaker for use with its "Motrac" two-way radio line. Fully transistorized, the new "Power Voice" speaker triples normal speaker audio output enabling users to hear radio messages hundreds of feet away from the speaker. As an additional feature, the speaker is equipped with an eight foot coil cord and special mounting brackets which provide temporary mounting of the speaker on the outside of a vehicle window. The radio speaker provides five watts audio output which is said to be the highest available from a standard speaker. This plus the supplemental unit supplies the additional volume.

Motorola Inc., Technical Information Center, Communications and Industrial Electronics Div., 4501 W. Augusta Blvd., Chicago 51, Ill.

For more details circle 115 on Enclosed Return Postal Card.

Portable Heater

A portable heater with an output of 320,000 btu's of forced warm air every hour is now being produced by the Master Vibrator Company. Under ordinary conditions, the unit is said to heat 7,000 sq. ft. of floor space with an 8 ft. ceiling.

The new unit is thermostat-controlled. To start it, the thermostat is set, and when the desired temperature is reached, the thermostat shuts off the fuel and ignition. At the same time, an automatic fan cut-off control allows



Master B-320 Portable Heater

the combustion chamber to cool and then turns off the fan. This new control is said to prolong the life of the motor and pump, keep the heater from blowing cool air, save electricity and give the user all the heat produced.

The unit plugs into any regular 115 ac volt outlet and operates on kerosene or No. 1 or 2 fuel oil, running up to 16 hours on one tank of fuel.

Master Vibrator Company, 364 Stanley Ave., Dayton 1, Ohio.

For more details circle 116 on Enclosed Return Postal Card.

Large Warning Light

The lens of a new Dietz warning light has the diameter of a traffic signal—8 inches—and delivers 60 candle power for 650 hours. To be used as an abutment safety light on toll roads and limited access highways, the new No. 680 flasher is equipped with a single face parabolic reflector lens, two NEDA No. 6 dry cells, transistorized circuit, carrying handle and mounting bracket. Flash rate is 65 per minute. Tamper-proof mounting and on-off bolts require special Allen-type wrench.



Dietz 680 Flasher

es. Finished in beacon yellow, fixture is available with either amber or red lenses. Weight is 8 lb.

Department P, the R. E. Dietz Company, Syracuse, New York.

For more details circle 117 on Enclosed Return Postal Card.

Twin Beam Screed

A new twin beam vibrating screed that is ideal for striking off narrow slabs such as sidewalks and prestressed concrete beams is announced by Stow Mfg. Co. This new screed consists of a vibrating unit driven by a 1 hp electric motor or a 2½ hp gasoline engine. Vibration is transmitted to two beams, the first of which strikes off the concrete and the second one removes any



Stow Twin Beam Screed

air bubbles, leaving a completely smooth surface, the manufacturer states.

Features of this new screed are its light weight 140 lb. for 4-ft. length and the ability to adjust its amplitude of vibration to suit the particular job. By turning the eccentric on its axis and then locking it in position with set screws any desired amplitude can be obtained. Available in lengths 4 ft. to 12 ft.

Stow Mfg. Co., 65 Shear St., Binghamton, N. Y.

For more details circle 118 on Enclosed Return Postal Card.

Dual Shaft Vibrator

Vibro-Plus Products, Inc. announces a new dual shaft electric vibrator, for applications such as vibrating tables, feeders, screens, chutes or for problems best solved through the use of directed force. Known as the Model ET-31, the unit develops a directed force vector



Vibro-Plus Vibrator

through the use of two eccentrically weighted armature shafts geared together to rotate in opposite directions.

Equipped with four adjustable eccentrics, the ET-31 can be set to produce impacts from 760 to 2200 lb. at 3600 vpm. It is a totally enclosed non-vented unit; heavy-duty bearings insure long life with greasing required only once a year or every 2,000 working hours, the manufacturer states. The ET-31 is available for operation on 3-phase, 60 cycles—220 or 440 volt, and is normally supplied with a starter box. Special mounting brackets are available.

Vibro-Plus Products, Inc., Stanhope, N. J.

For more details circle 119 on Enclosed Return Postal Card.

Sewer Cleaner

A new tool designed for cleaning sewers is the self-rotating "Root Hog" announced by the Juswel Company. The tool is of heavy welded construction throughout and has specially designed cutters that will not damage the pipe wall, the manufacturer states.

The unit is said to remove roots by double action: forward for cutting, re-



Juswel "Root Hog"

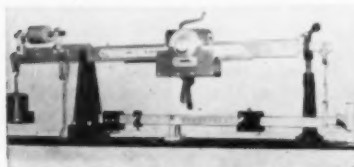
verse for dragging out roots. Other features include a swiveled draw bar of tool steel and threaded ballast plug for weight control. The unit comes in stock sizes for 8 in. through 18 in. round sewer pipe. Other sizes and models for curved pipe are also available.

The Juswel Company, 1266 Acton Rd., Columbus, Ohio.

For more details circle 120 on Enclosed Return Postal Card.

Beam Scale

A ticket-printing beam scale with an auxiliary tare beam is announced by



Thurman Ticket-Printing Scale

the Thurman Scale Company. With capacities up to 60 tons, this 25-ton ticket printing beam has a 10-ton tare bar attachment to permit user to record net weights of materials payload on a printed ticket.

Thurman Scale Company, 156 N. Fifth St., Columbus, Ohio.

For more details circle 121 on Enclosed Return Postal Card.

Radiator Safety Cap

A newly designed pressure radiator cap named "Safe-T-Cap" has been developed by Truckstell Manufacturing Co. to guard against the scald hazard in servicing automotive pressurized



Truckstell "Safe-T-Cap"

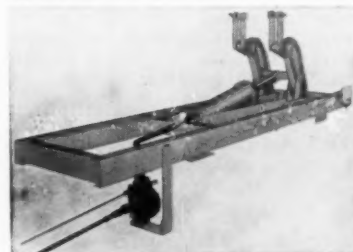
cooling systems. To remove the cap from a cooling system under pressure, simply push its green button and the pressure vents out the radiator overflow.

Truckstell Manufacturing Co., Union Commerce Building, Cleveland, Ohio.

For more details circle 122 on Enclosed Return Postal Card.

Single-Cylinder Hoist

A new single-cylinder, 8-in. underbody hoist that will haul and dump up to 18½ tons of material under normal conditions is announced by Marion Metal. The model HD-829 is designed for use primarily on tandem trucks and has capacity to do heavy duty work in quarries as well as general hauling assignments, it is said.



Maish HD-829 Hoist

Features of the new unit include lift arms made of cast alloy steel and heat treated to withstand wear and to give ample strength. A crosshead of heavy rolled steel; extra strength in the frame to resist bending and torsional stresses, and a frame all-welded with box type cross members.

The Jay H. Maish Company, Gospel Hill, Marion, Ohio.

For more details circle 123 on Enclosed Return Postal Card.

Battery Cell Tester

The new King Model CC-5 cell tester incorporates adjustable prods for easily spanning all types of battery cells, according to the manufacturer. It is said to indicate charged, dis-



King Cell Tester

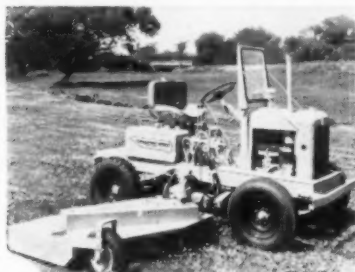
charged or dead cells instantly along with actual cell voltage, and to function equally well on 6, 12 or 24 volt batteries, either in or out of the vehicle.

King Electric Equipment Company, Cleveland 5, Ohio.

For more details circle 124 on Enclosed Return Postal Card.

Rotary-Sickle Mower

The prime mower chassis of the Topeka "Forty Mile" mower is now available with a hydraulic side-mounted rotary mower featuring fast dismounting and mounting operation and overlapping twin cutters that mow a 5-ft. swath. The machine cuts from 2 in. up to 90 deg. and cuts down-slopes ranging to 65 deg. making it possible



Topeka Mower

to mow steep banks. The rotary interchanges with the sickle-bar mower in 15 minutes, with no extra plumbing needed, the manufacturer states. The mower is available from the factory as a rotary or sickle-bar mower. Either type can be purchased as a separate attachment for interchangeable field mounting.

Topeka Hiway Mower, Inc., 623 E. 7th, Topeka, Kan.

For more details circle 125 on Enclosed Return Postal Card.

Masonry Blades

A new series of break-resistant blades for use on all masonry materials has been introduced by the Clipper Manufacturing Company. The new blades



Clipper Reinforced Blades

known as the Blue Bond series, feature a patented Clipper manufacturing process, "Leno-Weave" fibre glass reinforcing. The strength and flexibility of glass cloth is combined with this process to give the blades the necessary strength and rigidity to resist breakage. The reinforcing is used in much the same manner that imbedded steel reinforcing rods are used in concrete structures to insure adequate strength.

The normal abrading action of the cutting operation, does not wear the reinforcing material, the manufacturer states.

Clipper Manufacturing Co., Suite 250, Kansas City.

For more details circle 126 on Enclosed Return Postal Card.

Warning Lamp

Grote Manufacturing Company announces the D-257 dual-faced emergency warning lamp, a high intensity lamp for specific use as emergency warning signals for highway maintenance trucks and snow plows.

The unit has two 7 in. shatter-proof, fadeproof acrylic plastic lenses, mount-



Grote Warning Lamp

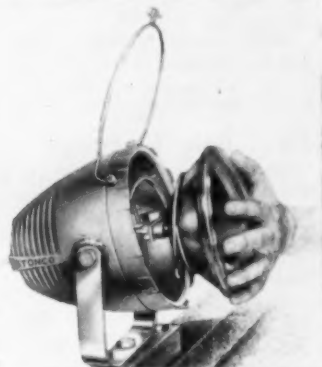
ed to provide warning signals in two directions. Its body is one-piece heavy gauge steel with baked black enamel finish. The heavy steel mounting pedestal is also finished in baked black enamel and has a 7/8 in. hollow threaded mounting stud and rubber mounting pad. This lamp is available with red, amber or blue lenses.

Grote Manufacturing Co, Bellevue, Ky.

For more details circle 127 on Enclosed Return Postal Card.

Snap-in Flood Light Lamp

The new line of outdoor Power Beam floodlights announced by Stonco Electric Products Co., includes spring construction that greatly reduced relamping time, the manufacturer states. A heavy-duty steel coil spring automatically pops the old lamp out and the new lamp snap into place. Once secured, the lamp "floats" in a coil-spring



Stonco Floodlight

cradle that guards against many common causes of premature lamp failure, such as excessive vibration caused by rumbling traffic, shock or pole-whip.

Floodlights in the line are for up to 300-watt, 2,000-hour sealed beam lamps and are available with a wide variety of mounting devices.

Stonco Electric Products Co., 333 Monroe Ave., Kenilworth, N. J.

For more details circle 128 on Enclosed Return Postal Card.

Off Highway Trucks

A new 230 series of off-highway heavy-duty International trucks with choice of gasoline, LPG or diesel powered engines has been introduced by the motor truck division of International Harvester Company. The new series, which includes six basic models in both four-wheel and six-wheel design, offers gross vehicle weight ratings ranging from 46,000 to 73,000 lb.

Design features include diamond plate steel fenders, heavy-duty brush guard, double-channel heat-treated frame, two new rear axles and a broad selection of heavy-duty optional components.

Gross vehicle weight of the standard 230 four-wheel model is 46,000 lb.



International Harvester 230 Series Model 230-D

Standard F-230 six-wheeler is rated at 59,000 lb. GVW. With optional 18,000 lb. front axle and 55,000 lb. rear axle, the six-wheel model offers a GVW rating of 73,000 lb. Engine availabilities for both four-wheel or six-wheel models are the International Red Diamond 501 six rated at 212 hp, International V-549 V-8 rated at 257 hp, and Cummins NH, HR and NT series diesels. Both six-cylinder and V-8 powerplants are offered with factory-installed LPG fuel systems.

International Harvester Company, 180 N. Michigan Ave., Chicago 1, Ill.

For more details circle 129 on Enclosed Return Postal Card.

Pipe, Bolt Threader

Three low-cost accessories, designed and developed by the Ridge Tool Company, immediately convert the portable "Ridgid 300 Power Drive" into a fast, easy-to-operate pipe and bolt threader, the manufacturer states. Accessories in-



Ridgid Power Drive-Threader

clude an aluminum carriage and cutter; the new carriage is said to accommodate any "Ridgid 500" series quick opening dies, pipe or bolt. Both die head and cutter operate independently, swinging up out of the way when not in use.

The Ridge Tool Company, Elyria, Ohio

For more details circle 130 on Enclosed Return Postal Card.

Reverse Mounted Loader

A new reverse mounted loader, the RL-400 Series, has been added to the line of construction equipment produced by Henry Manufacturing Company, Inc. Designed primarily for stock pile work, the RL-400 features a self-loading bucket. The one yard bucket is loaded by hydraulic power and does not depend on the traction of the tractor. A specially designed con-



Henry Loader With Self-Loading Bucket

trol valve enables the bucket to self-level.

The unit is designed to mount on utility tractors and has a lifting capacity to full height of 3,000 lb. Break-away capacity is 4,500 lbs.

Henry Manufacturing Company, Inc., P. O. Box 521, Topeka, Kan.

For more details circle 131 on Enclosed Return Postal Card.

1/2-Inch Drill

A new version of Black & Decker's general purpose tool, the 1/2 inch special drill, incorporates a convenience feature previously available only in heavy-duty units. Designated as the new reversible 1/2 inch special drill, the tool is fitted with a switch by which full power can be applied to turn the auger in reverse, causing it to literally back itself out of the drilled hole.

The new drill is equipped with a trigger switch for on-and-off control of power. With the reversible feature added in this tool, however, the two switches have been wired to prevent damage to the motor through carelessness. The trigger switch must be released and the power off, before the reversing switch can be actuated.

The Black & Decker Mfg. Co., Towson 4, Md.

For more details circle 132 on Enclosed Return Postal Card.

Portable Air Compressor

Gardner-Denver Company has introduced a new design of its 125 cfm rotary portable air compressor. The new design is said to increase horsepower capacity 15 percent for more fuel economy. Also, "Thriftmeter Control" automatically regulates the engine speed to meet air demand.



125 CFM Air Compressor

The Model RP-125 features anti-blowback suction unloading valves and a large toolbox that is both tamper-proof and weather-proof, the manufacturer states. An automatic water circulating system insures that the compressor and engine operate at a constant temperature, despite temperature changes.

Gardner-Denver Company, Quincy, Ill.

For more details circle 133 on Enclosed Return Postal Card.

Asphalt Plant

A new completely portable 6000 lb. batch capacity asphalt plant is available from Standard Steel Corporation. The entire Model TM-3000 portable drying and mixing unit is self-contained in its own trailer frame. It can be transported to any job location, and be set up and producing hot mix within eight hours with Standard's exclusive push-button erection. A built-in power hoist automatically raises the mixing unit from transport to operating position in less than 30 minutes.



Standard Portable Asphalt Plant

Production capacities as high as 120 tph are available with this new unit. This trailer-mounted plant features super-lift dryer with saw-tooth lifters; high speed mixer; Simplex push button batching control; positive control of liquid asphalt; complete accessibility to mixer and other equipment; and a completely portable dust collecting unit. The plant is also available in 1000, 1500 and 2000 lb. batch capacities.

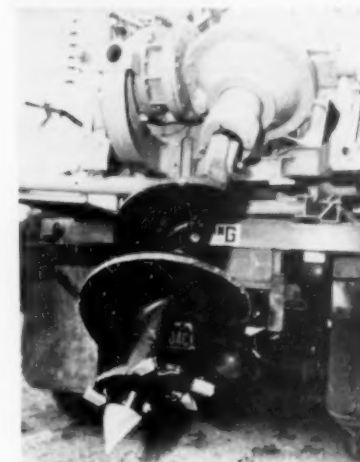
Standard Steel Corporation, P. O. Box 58252, Los Angeles 58, Calif.

For more details circle 134 on Enclosed Return Postal Card.

Earth Auger

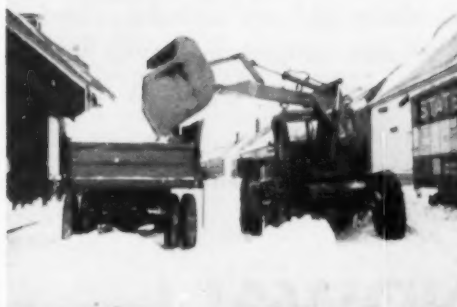
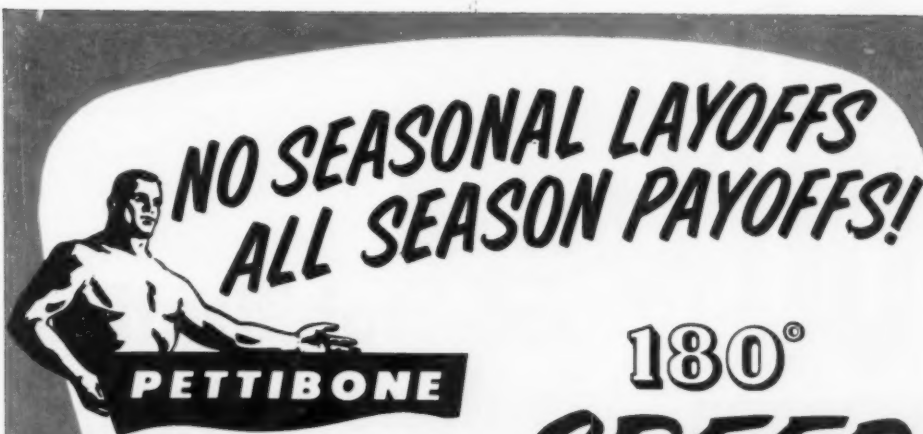
The newly designed "PolerBore" auger by Trainer Associates, Inc. features a special cutting tooth setting that aids in boulder digging. The unit digs through frost or frozen ground, sandstone, hard rocks, concrete, coral, marl, and frost, the manufacturer states.

The "PolerBore" is said to dig and carry off matter in one smooth func-



Trainer "PolerBore" Auger

Continued on page 143



180° SPEED SWING

ALL-PURPOSE MATERIAL HANDLER

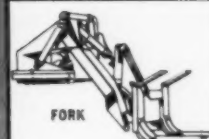
YOU PROFIT with a Pettibone Speed Swing because you never have to lay it off due to seasonal changes or job operation difficulties.

Its amazing versatility and all-around applicability puts it on call 365 days a year! It's always ready and able to handle every call covering a host of different kinds of jobs. In fact, the necessary downtime of a Speed Swing is held to an absolute minimum . . . just long enough for you to make a fast switch to any one of the 10 quickly-interchangeable attachments. Then it's off to tackle the next job on your schedule. And this goes on the year around!

With the exclusive Pettibone 180° swinging boom, it handles a score of different materials faster and safer because it swings the load instead of the loader. There's no gee-hawing, no costly, time-consuming maneuvering all over the lot! The Speed Swing works up close to the job with maximum safety, right alongside or in back of trucks . . . out of the way of moving traffic, out of the way of other equipment, out of the way of other workmen—OUT-PERFORMING other material-handling equipment day-in, day-out . . . on job sites of every description!

And, when winter comes, the Speed Swing will remove snow in record time without obstructing traffic. Or load out sand, cinders, or salt products for ice control. The above are just a few of the many reasons why the owner of a Speed Swing has no seasonal layoffs . . . just ALL-SEASON PAYOFFS!

Learn all the reasons why the Pettibone 180° Speed Swing is the most versatile, most productive all-purpose material handler for you. Write today!



FORK



BUCKET



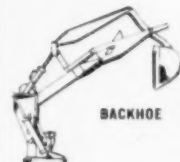
CRANE HOOK



18' BOOM
EXTENSION



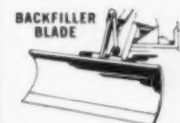
WIRE & PIPE
HOOK



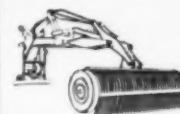
BACKHOE



CLAMSHELL



BACKFILLER
BLADE



BEACH RAKE



4 CU. YD.
SNOW BUCKET

PETTIBONE MULLIKEN CORPORATION

4700 WEST DIVISION STREET • CHICAGO 51, ILLINOIS

ROADS AND STREETS, December, 1959

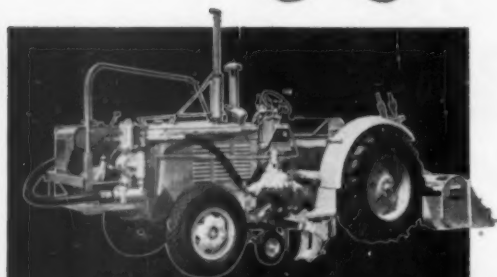
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80%

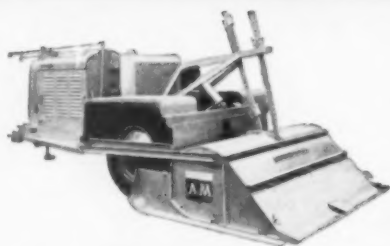
**of all
soil stabilization
is done with**

SEAMAN-ANDWALL

STĀ-BILT MIXERS



The **STĀ-BILT** Self-Propelled Mixer equipped with pump, tachometer, volumetric meter and spray bar.



The **STĀ-BILT** Pull-Type Mixer



The **STĀ-BILT** Self-Propelled Mixer

80% of all units used in stabilization are STĀ-BILTS. That fact is shown in an impartial market survey. There are plenty of good reasons — “plant mix quality at road-mix cost;” absolute control of aggregate segregation; high daily production of mixed and blended materials (up to a mile a day of 22 foot road) — all at low operating cost.

What's more, the STĀ-BILT MIXER handles any binder and any material — and it leaves the mix shaped to crown and grade, partially pre-compacted ready for final rolling.

**Call us for further information
— or a demonstration.**



SEAMAN-ANDWALL

A subsidiary of American-Marietta Company

Elm Grove 11, Wisconsin

New Products

Continued from page 140

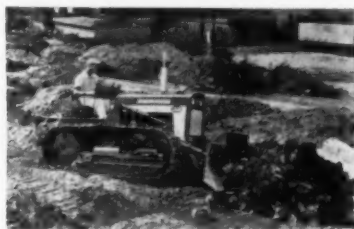
tioning operation because of its strong penetrator point and two flights with strategically placed teeth for graduated cutting action to drill, bulldoze or break up. The unit is available in 10 in. to 36. diameter sizes.

Trainer Associates, Inc., New Castle, Del.

For more details circle 135 on Enclosed Return Postal Card

Hydraulic Dozer

A hydraulic bulldozer, 85¼ in. wide and heavily reinforced for high-capacity earthmoving, has been introduced by International Harvester Company for use with the International T-340 crawler tractor. Only two control levers are needed to deliver a wide range of angle, tilt and height adjustments. The blade can be set to a depth of 11¼ in. below grade and raised to a height of 35 in. above grade. Angling



Hydraulic Bullgrader For T-340

positions vary from 25 deg. right to 25 deg. left. Either end of the blade can be raised or lowered as much as 15 in.

The bullgrader is mounted on the T-340 by means of a heavy sub-frame assembly which distributes the shocks and strains of heavy dozing along the entire unit, the manufacturer states. Dozer side-booms are located inside the tracks to provide maximum support and to allow working against banks.

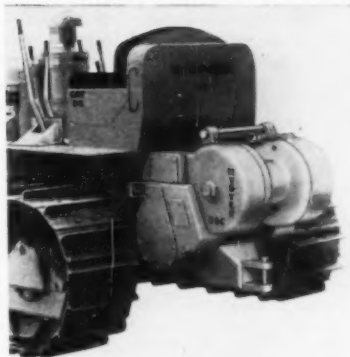
International Harvester Company, 180 N. Michigan Ave., Chicago 1, Ill.

For more details circle 136 on Enclosed Return Postal Card

Towing Winch

A new towing winch has been introduced by Hyster Company for mounting on Caterpillar D6 tractors and No. 977 Traxcavator. Designated the Hyster D6C towing winch, the unit is available in standard and "Lo-Speed" models. It replaces the Hyster D6N towing winch and D6N Worm Drive winch.

Easier shifting and longer control cable life are insured by a constant-mesh transmission utilizing a jaw clutch engagement spring to take the shock out of shifting, the manufacturer states. Gear arrangement has been simplified, and all gears are cut from special alloy steel and heat treated. New brake and clutch levers are similar to tractor master clutch and steer-



Hyster D6C Towing Winch

ing clutch levers, and are located for easy operation. The Lo-Speed winch provides line speeds as low as 23 fpm for jobs requiring high pull and low speed. A high-speed reverse is also a feature of this model.

Hyster Company, P. O. Box 328, Peoria, Ill.

For more details circle 137 on Enclosed Return Postal Card

Weight Charts

Purchasers of truck concrete mixers can predetermine the payload capabilities of any given mixer-truck combination by means of new weight distribution charts developed by the Transit Mixer Division, Hercules Galion Products, Inc.

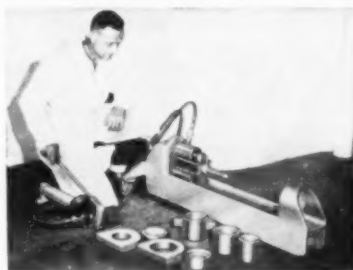
The new charts show weight distribution of the 5, 6 and 7 cu. yd. Hercules Galion "Separatengine" mixers, with right hand side mounted engine, and of the "Mixomatic F.E.P.T.O." mixers, with straight in-line drive and automatic automotive transmission in combination with tandem truck chassis of various types, and of the Hercules Galion 4 cu. yd. mixer with transmission power take-off drive, in combination with single rear axle truck chassis of various types. Charts for special installations are furnished upon request.

Hercules Galion Products, Inc., Galion, Ohio.

For more details circle 138 on Enclosed Return Postal Card

Equalizing-Beam Press

A new hydraulic press which removes and installs equalizing-beam center and end bushings on Hendrickson tandems, has been announced by Owatonna



OTC Service Press

Tool Company. The new press consists of a press frame mounted on casters, seven adapters for the removing installing applications, and a 30-ton capacity OTC "Power-Twin" "center hole" hydraulic ram and pump assembly. The latter is detachable and interchangeable with other OTC products such as pullers and shop presses.

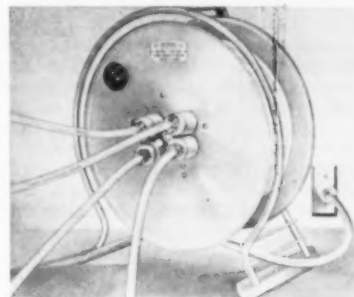
Both center and end bushings can be serviced with the new press; the center bushings can be serviced without removing the tires or wheels. Truck rear cross member is raised and lowered by means of a railroad jack or equivalent to permit the press to be aligned with the equalizing-beam bushing. Adapters are then positioned for the removing and installing applications.

Owatonna Tool Co., 417 Cedar St., Owatonna, Minn.

For more details circle 139 on Enclosed Return Postal Card

Portable Cord Reel

A newly designed "Safety Yellow" portable cord reel has been introduced by the Daniel Woodhead Co. The "Safeway No. 910" features four multiple service "U" blade type receptacles. This provides power outlets for a number of varied applications at one time.



Woodhead Cord Reel

from one power source. The new reel is said to eliminate cord damage, preventing it from twisting, tangling or breaking. It has a cord capacity of up to 375 ft., depending on cord size used. Other features are said to include a heavy steel rod frame, a balanced-load carrying handle, large re-wind knob, and no collector rings, brushes or slip-rings to wear out.

Dept. CR, Daniel Woodhead Co., 15 N. Jefferson St., Chicago 6, Ill.

For more details circle 140 on Enclosed Return Postal Card

18-Gauge Shear

A hand-held electric shear that weighs 6½ lb. and will cut through 30 fpm of No. 18 gauge cold-rolled steel is available from the Black & Decker Manufacturing Company. Identified as the No. 18 shear, the new tool is designed to deliver 2,500 cutting strokes per minute under full load.

For operation, the unit requires only slight forward pressure and can follow pattern lines perfectly, with the cutting

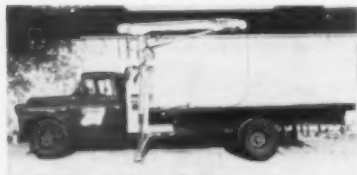
blade visible at all times, the manufacturer states. It is equipped with the B. & D. shear motor with spiral bevel gears, ball bearings, forged connecting rod, centrifugal fan and heavy-duty switch. Rated and identified by its cutting capacity in cold-rolled steel, the new shear will handle monel metal or stainless steel in thicknesses up to 20 gauge.

The Black & Decker Mfg. Co., Towson 4, Md.

For more details circle 141 on Enclosed Return Postal Card.

Hydraulic Crane

A new model of the fully-hydraulic "Versa-Lift" crane with a new hydraulically "extensible-retractable" boom has been announced by Teale and Company. Called the 400-E, the unit's boom features a cable "take-up" system that keeps loads at the same height (or distance from the sheave, in the



Teale Extensible Boom Crane

case of vertical movement) as the boom is extended or retracted. The new boom extends or retracts under full load regardless of angle.

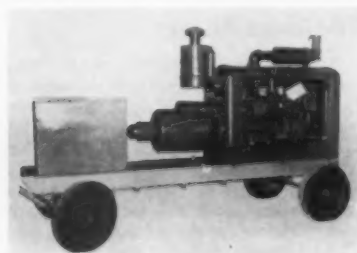
The crane works in a full 360 deg. circle and lifts from 7,000 lb. at 8 ft. (retracted) to 3,500 lb. at 16 ft. (fully extended).

Teale and Company, P. O. Box 308, Omaha, Neb.

For more details circle 142 on Enclosed Return Postal Card.

Welding Generator

A new "giant" diesel-driven DC welding generator, designed for the field installation of 7/8 in. diameter shear connector and other type studs, is announced by the Nelson Stud Welding Division of Gregory Industries, Inc. Three heavy duty NS-9 stud welding guns may be operated simultaneously in the field from the new power source. Designated the "Nelwelder FD" unit, it furnishes power at 2,000 amperes, 80 volts. With the addition of available accessory controls, the machine may be used for arc air gauging or hand arc welding.



Nelson NS9 Generator

The engine, directly connected to the generator, is a 6-cyl., 2-cycle, 2100 rpm water cooled diesel equipped with an electric starting motor. Mounted on rubber tired wheels for easy movement, the new generator measures 107 in. in overall length, and weighs 5,000 lb.

Nelson Stud Welding Division, Gregory Industries, Inc., Lorain, Ohio.

For more details circle 143 on Enclosed Return Postal Card.

Earth-Borer Mechanism

The Utility Division of Highway Trailer Company has introduced a new power-leveling mechanism, now available on two models of its earth-boring machines. The device, which is said to make positioning fast and easy in all directions, is optional equipment on Highways Model HDA and HDAMS earth-borers.

With dual power-leveling control conveniently located at the top, a turn of the mechanism puts the rack bar and derrick in the position desired. This feature permits rapid leveling where necessary on guard rail and line construction jobs. Engineered for positioning in any angle up to 90 degrees, the mechanism is ideal for work in rough uneven terrain, the manufacturer states.

It also permits fast maneuvering of machine fore and aft, left to right. This flexibility makes straight-down drilling uncomplicated regardless of truck position.

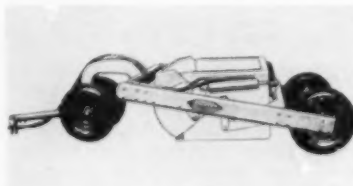
Highway Trailer Company, New York 17, N. Y.

For more details circle 144 on Enclosed Return Postal Card.

2 1/2 Yd. Scraper

Johnson Mfg. Co. announces its first conventional scraper, new 2 1/2 yd. unit, available in the 4-wheel Model 25 and straight tongue Model 25LD. The scraper is powered by a 3-4 plow farm tractor.

The Pan tilts past 90 deg. to give a fast, clean ejection that eliminates material compaction. All-hydraulic con-



Johnson 2 1/2 yd. Scraper

trol system consists of one 4-way control valve and two hydraulic lines. Short over-all length and tight turning radius permit operation in close quarters. High scraper underclearance lets tractor pull fully-loaded scraper at high speeds over rough terrain. Other scrapers include elevating models in 4, 5, 8 and 11-yd. capacities.

Johnson Mfg. Co., Lubbock, Texas.

For more details circle 145 on Enclosed Return Postal Card.

Tollway Tractor

A new "Huskie" tractor for hauling double bottom rigs (tandem trailers) on tollways at continuous speeds and at gross weight combinations of up to 127,400 lb. has been announced by Brockway Motor Trucks. Listed as the N260LFM, the tractor is designed for non-stop cruising at allowable maximum miles per hour and to assure operation well above minimum tollway speed requirements.



Brockway "Huskie"

The new tractor features a greatly enlarged cooling system, accommodations for diesel engines ranging in horsepower up to 375, transmission combinations with selected ratios to prevent the unit from losing momentum on grades, plus an extra-rigid frame to eliminate side sway, cradled on heavier spring hangers to increase riding and handling stability. The tandem drive rear axles, with inter-axle differential, are standard on this model.

Brockway Motor Trucks, Cortland, N. Y.

For more details circle 145 on Enclosed Return Postal Card.

Air-Ride Seat

The new model of the "Flexible-Air Ride" seat has been introduced to the municipal and county government maintenance equipment field by the Flexible Air Seat Corporation. This new improved model is said to provide added comfort and help eliminate back trouble experienced by drivers of firm riding, heavy duty special equipment used in maintenance and construction projects.

Seat assembly is supported on a soft cushion of compressed air contained in a special diaphragm and cannister located below the seat. This air storage method absorbs pitching, swaying and shocks transmitted from the road be-



"Flexible Air Ride" Seat

fore they can reach the driver, the manufacturer states. Comfort control adjustments can be operated by the driver while he is in the seat to insure individual comfort requirements.

Flexible-Air Seat Corporation, 717 W. 11th St., Los Angeles 15, Calif.

For more details circle 147 on
Enclosed Return Postal Card.

Safety Flag

Industrial Products Company has added a new warning flag to its line of safety warning equipment. Diagonal reinforcing stays, as well as the fabric itself, are non-conductive and non-magnetic, making these flags ideal for many municipal and utility applications, the manufacturer states.

"Ray-D-8" flags are said to provide more permanent outdoor protection on highways because their strong vinyl-bonded-to-nylon construction resists fading, discoloration, abrasion and temperature extremes. The flags are now available in sizes up to 24 in. x 24 in. and in many color combinations—including rocket red, yellow and yellow-red.

Industrial Products Company, 2924 N. Fourth St., Philadelphia 33, Pa.

For more details circle 148 on
Enclosed Return Postal Card.

Safety Belt

Designed especially for reinforcing iron workers using the Ideal Tie Wire Reel for tying steel in place above ground level on walls, columns, etc., the new "Safety Snap" assembly fastens securely to the re-bar, and frees both of the workman's hands for safe handling and placement of reinforcing steel bars.

The belt is made of 2 in. steer har-



Ideal Safety Belt

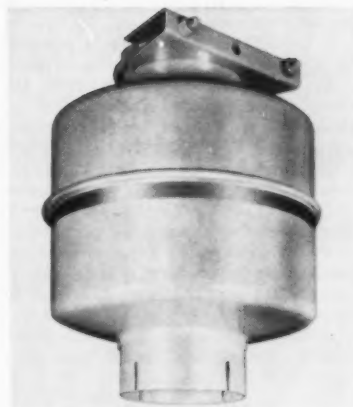
ness leather, 1/4 in. thick and the tongue is lined with yellow latigo leather to insure complete safety at the buckle-hole portion. The snap assembly is drop forged and has a safe working load of 1125 lb. and a breaking strength of 4500 lb. All hardware is cadmium plated.

Ideal Reel Co., 1421 Madison St., Paducah, Ky.

For more details circle 149 on
Enclosed Return Postal Card.

Spark Arrestor

A compact Gill Spark Arrestor for gas or diesel engines using a four-inch exhaust stack is introduced by Erickson Products Co. It is primarily designed for large trucks, tractors, loaders and other equipment used in for-



Gill Spark Arrestor

ests, fields, brush and other hazardous areas where incandescent exhaust carbon can start fires.

Almost 100 percent of the exhaust carbon from the engine is trapped at every throttle position, the manufacturer states.

Erickson Products Co., 1960 Carroll Ave., San Francisco 24, Calif.

For more details circle 150 on
Enclosed Return Postal Card.

Conveyor Belt

The Manhattan Rubber Division of Raybestos-Manhattan, Inc., has announced that its "Ray-Man" conveyor belt can now be used with 45 deg. troughing idlers for carrying all materials.

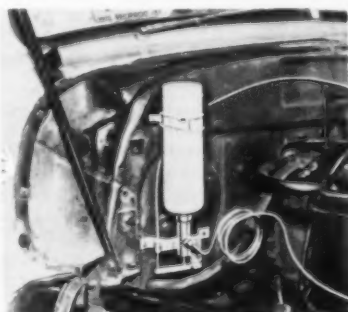
Construction of the belt is compensated so that the outer ply stretches as the inner ply contracts under both lateral and longitudinal flexing and on reverse bends. The outer strength member plies are constructed with a special weave, high-strength synthetic fabric of controlled elasticity which is said to relieve stress on the belt as it travels over idlers and terminal pulleys.

Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J.

For more details circle 151 on
Enclosed Return Postal Card.

Diesel Starting System

Quick cold-weather starting for all types of diesel equipment is said to be possible with the "Quick-Start" diesel engine starting system, manufactured



Turner "Quick Start" for Diesels

by the Turner Corporation. The system operates on a compounded ether-base mixture designed to provide an extra "hot" boost for starting all types of diesel engines in temperatures as low as -65 dg.

The system is operated by one man from the driver's seat of the truck or equipment. A special choke activates the system, injecting the mixture into the air intake of the engine, the maker states.

Turner Corporation, Sycamore, Ill.

For more details circle 152 on
Enclosed Return Postal Card.

Engine Heater

Thermo-Temp Industries, Inc. has announced a new engine heater that automatically maintains operating temperature of the coolant in gasoline, diesel and propane fueled engines even when the engines are not running. It also guards against low temperature starting problems and cold engine wear, the manufacturer says. The heater is an automatic and independently-operating unit that becomes an integral part of the cooling system and does not interfere with the normal engine function. It operates on the engine's own fuel supply and is thermostatically controlled to maintain engine temperature at proper operating level.

Thermosiphon action created by the heating unit takes the coolant from the engine, circulates it through a heated water jacket and returns it to the engine. When the Engine reaches operating temperature the unit is shut off automatically and is re-started when the temperature falls to a predetermined point.

A dashboard control switch can be set on "automatic" to maintain constant engine temperature control or a timer can be set for from 5 minutes to 12 hours to pre-heat the engine prior to starting.

Thermo-Temp Industries, Inc., 7712 Second, Detroit 2, Mich.

For more details circle 153 on
Enclosed Return Postal Card.

Rotary Rock Bit

Varel Manufacturing Company has developed a new formation type rock bit to meet the needs of blast hole drilling in quarrying operations where fast penetration rates are necessary but where excessive gauge wear has been a problem. The new bit formation type is the Varel V₃T developed to provide drilling contractors with increased hard limestone or sandstone.

The bit maintains "balanced design" in which each cone's tooth-cutter arrangement is balanced in relation to the other cones. This assures long bearing life and even bearing wear on all three cones while providing optimum bottom hole cutting pattern for faster drilling, the manufacturer states.

Varel Manufacturing Company, 9230 Denton Dr., Dallas 20, Texas.

For more details circle 154 on
Enclosed Return Postal Card.

Muffler Sealer

Availability of "Magic Muffler Sealer" in bulk containers, as well as in individual 6 oz. plastic tubes is announced by Magic Iron Cement Co., Inc. The product is now packaged in 3 lb. cans for garage and fleet use.

The heat-proof material is said to



Magic Muffler Sealer

"work" like putty. Its use is claimed to assure a leak-proof seal between manifold and muffler and muffler and tail pipe, speed up installations, eliminate possibility of exhaust leaks, prevent rusted connections and then facilitate muffler removal.

Magic Iron Cement Co., Inc., 5403 Bower Ave., Cleveland 27, Ohio.

For more details circle 186 on Enclosed Return Postal Card.

Portable Drilling Units

Major changes in design and construction of several models in the Truco line of portable diamond drilling machines have been announced by the Masonry Drilling Division, Wheel Truening Tool Company. A realignment of power units available with these machines, resulting in a wider range of use, also was announced. The new Model A portable masonry drilling machine offers a choice of electric motors of 900 rpm, capacity 1 in. to 4 in. o.d. holes; 430 rpm, capacity 2 in. to 5½ in. o.d. holes, or 325 rpm, capacity 3 in. to 6¼ in. o.d. holes. New



"Truco" Diamond Drilling Machine

Model A-1 is powered by 700 rpm air motor, capacity 1 in. to 6½ in. o.d. holes, and model A-2 is powered by a 500 rpm gasoline engine, capacity 2 in. to 6½ in. o.d. holes. New features of design and construction include a new, heavier, telescoping center post with quick-action pin-and-hole adjustment to lock column at desired heights and eliminate column rotation while drilling; a 6 in. steel screw in the top of the telescoping post which gives the final, exact adjustment when locking the unit against ceiling or wall, and a heavier machine column for greater rigidity in heavy-duty drilling. It is set in a heavier column bracket. A new drilling head guide now gives 19 in. of travel.

Masonry Drilling Division, Wheel Truening Tool Company, 3200 W. Davison, Detroit, Mich.

For more details circle 187 on Enclosed Return Postal Card.

Metal Primer

Krylon Rust Magic metal primer, new metal primer in spray or brush type that dries in 20 minutes, and is compatible with almost any finish coat, is the latest product to be released by Krylon, Inc.

The metal primer contains a special phenolic resin penetrant which carries the pigment and vehicle through sound



Sizes of Containers For Krylon

rust and locks itself tight to the substrate, the manufacturer states. This saturating action neutralizes porous rust and makes it an actual ingredient of the paint film. Krylon Rust Magic dries to the touch in 20 minutes, and can be topcoated in 2 hours. Its elasticity is reported to permit expansion and contraction in metal surfaces caused by weather changes.

Krylon, Inc., Norristown, Pa.

For more details circle 188 on Enclosed Return Postal Card.

Dual Wheel

A new dual wheel front steering axle has been announced by Bolling Wheel & Axle Division, Anderson-Bolling Mfg. Co. The assembly provides independent rotation of each of the four tires as well as braking on all tires from conventional braking equipment. The axle is offered in two capacities, 18,000 and 30,000 lb. Both axles have been designed to meet all truck manufacturers' specifications, it is stated.



Bolling Dual Wheel Front Steering Axles

Additional braking capacity as well as reduced front end skidding is obtained by doubling the front end ground contact. Safety against jack-knifing is also claimed on truck trailer combinations by shifting of the fifth wheel location forward. The 30,000 lb. capacity dual wheel front steering axle has been designed for crane carriers and off the road equipment. It is offered as a replacement for present tandem axle designs, or itself can be mounted in tandem axle fashion to provide for 60,000 lb. front end loading.

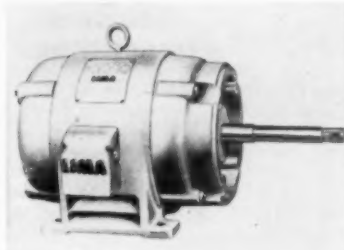
Bolling Wheel & Axle Division, Anderson-Bolling Mfg. Co., Grand Haven, Mich.

For more details circle 189 on Enclosed Return Postal Card.

Pump Motors

The Lima Electric Motor Co., has announced a line of drip proof close coupled pump motors in New Nema rated frame sizes, from ½ hp at 900 rpm through 75 hp at 1800 rpm—frames 182 through 405 U. Explosion-proof and totally enclosed fan-cooled from ½ hp, 900 rpm through 30 hp. Frames 182 through 326 U.

Connection boxes can be rotated to make connecting easier. The die cast



Lima Pump Motors

aluminum rotors are equipped with dual cooling fans and the entire rotor assembly is dynamically balanced. Pre-lubricated sealed ball bearings require no cleaning; the correct quantity of lubricant is sealed in, dirt and moisture are sealed out, the manufacturer states. The motors can be furnished in either 3 or 2 phase, and in all frequencies and commercial voltages below 600.

Sales Promotion Manager, The Lima Electric Motor Co., Inc. Dept 253, Lima, Ohio.

For more details circle 190 on Enclosed Return Postal Card.



No area above the **Diamondfoot** comes in contact with the soil to alter psi rating; further, rolling drag and material pick-up are minimized.



The leading and trailing edges of the **Diamondfoot** make easy foot penetration and withdrawal in heavy soils.



Cross-section dimensions of the **Diamondfoot** are greater than any cross-section dimensions of the tapered shank. Full compaction effort is always exerted at the foot face and not dissipated through shank contact.

New **BROS** relief shank tamping foot provides full compaction effort and less drag

● Stress-relieved shank of the new BROS Diamondfoot design has two major advantages for earthwork compaction. Here's why:

First; to produce the lbs. per sq. in. foot pressure required by subgrade sheepsfoot rolling specifications, the BROS design permits the *full* compaction force of the roller drum to be exerted at the *bottom* of the foot—and not dissipated by shank contact with the soil materials. *That's because the Diamondfoot has a larger cross-section than any cross-section of the reverse tapering shank.*

Second; this design minimizes rolling drag because in penetration and withdrawal, the

Diamondfoot edge design provides the least disturbance to the soil. Too, by reverse tapering, the shank is load relieved and the heavy soil materials have little chance to cling.

Other important features of this engineered Diamondfoot Roller include: Unitized drum and axle; non-adjusting, sealed, self-aligning ball bearings, *outside mounted*. Adjustable and reversible cleaner teeth provide extra long service life.

BROS Diamondfoot Rollers range in sizes from 133 psi to 724 psi foot pressures. Your nearest BROS Dealer has all the details. Or write us. Worldwide sales and service.



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9 AND 13-TON
ROLLERS

Traffic Safety

Focus on Highway Use Problems Urged

What will the state need by way of traffic engineers, traffic police, driver license examiners and other trained personnel to properly operate new roads now being built?

For Virginia, this get-ready job was spelled out recently by Joe O. Mattson, president of the Automotive Safety Foundation, a non-profit research organization of Washington, D.C. Speaking at a luncheon to present the Virginia highway engineers with awards for notable achievement in traffic safety work, Mattson noted that all problems of highway operation will be intensified—that there will be more miles of highway travel in the U.S. during the next 18 years than in all of the past years of this century combined.

Unless the state agencies immediately begin long-range studies of the functions of government concerned with highway use, the public will never get the full benefit of the new roads now being built. "If we wait for the coming flood of traffic to arrive, with no advance preparation, we will see real chaos on our streets and highways," Mattson said.

Mattson stressed the need for carrying on a balanced program in traffic safety work. This would include attention to laws and ordinances, accident records, motor vehicle administration, driver education, law enforcement both by police and courts, highway and traffic engineering, and community safety organization. Emphasis on one type of traffic safety activity at the expense of the others cannot achieve lasting results, Mattson said.

The urgent need to step up activity on all of the fronts of traffic safety is highlighted by the recent warning of the President's Committee for Traffic Safety, that this year will see the greatest number of traffic deaths in U.S. history and that 1960 will be even worse unless the trend is promptly reversed, Mattson said.

Better Flashing Lights on School Buses

A simple method for increasing the visibility of flashing signal lights on school buses, particularly in bright sunlight, was scheduled for showing by automotive lighting experts to the National Conference on School Transportation at the University of Kansas, October 4-8. The Automobile Manufacturers Association reports that the method, which consists of surrounding the lights with a small field of black, was suggested during light visibility tests recently conducted by the AMA Vehicle Lighting Committee and the Society of Automotive Engineers.

Presenting the demonstration will be two engineers representing the AMA and SAE, George E. Meese of General Electric Corporation, and George Onksen of Guide Lamp Division, General Motors Corporation.

The purpose was to show that present red and amber warning lamps are more easily seen against a black background than against the yellow paint of the school bus.

Edge Marking on Increase, Survey Shows

Only a few years ago the use of a painted line to mark the pavement edge was either unthought of or not taken seriously by most state highway departments.

Today it's an entirely different picture. A survey of state highway department practice on this detail, made recently by Cataphote Corporation, makers of striping equipment and materials, shows that thousands of miles of state roads are now so protected. The states which haven't adopted right shoulder guide lines and edge markings are in the minority.

Here are some of the survey findings:

1. Of 42 states replying, only 11 do not use such markings.
2. The remaining states placed outer stripes on 36,605 miles in 1958. The 1959 figure will be higher.

3. Ohio leads with 13,623 miles and 14,502 miles in the two respective years.

4. Most states reflectorize all such striping; the remainder nearly all.

5. Approximate cost per mile for both center and outer line (for states reporting extensive striping) varied widely. The range was from less than \$70 to more than \$150, with a scattering between.

6. Two states report reduced shoulder maintenance as a result of outer striping. Most states have not studied such saving—indicating a potential research of value.

7. A few states reported a reduction in accidents traceable to the practice, but again most states have produced no data on the subject.

8. Public reaction "excellent" or "very good" was reported by 15 states, "favorable" or "good" by 9 others.

9. Advantage of the outer striping most frequently mentioned is the ability to help drivers see better at night or in bad weather. Disadvantages were cited by a few scattered states: "Must be swept regularly," "encourages use of shoulder for added lane," "No good in snow," or "cost." Most states however indicated intention to continue and possibly step up use of edge or outer shoulder striping.

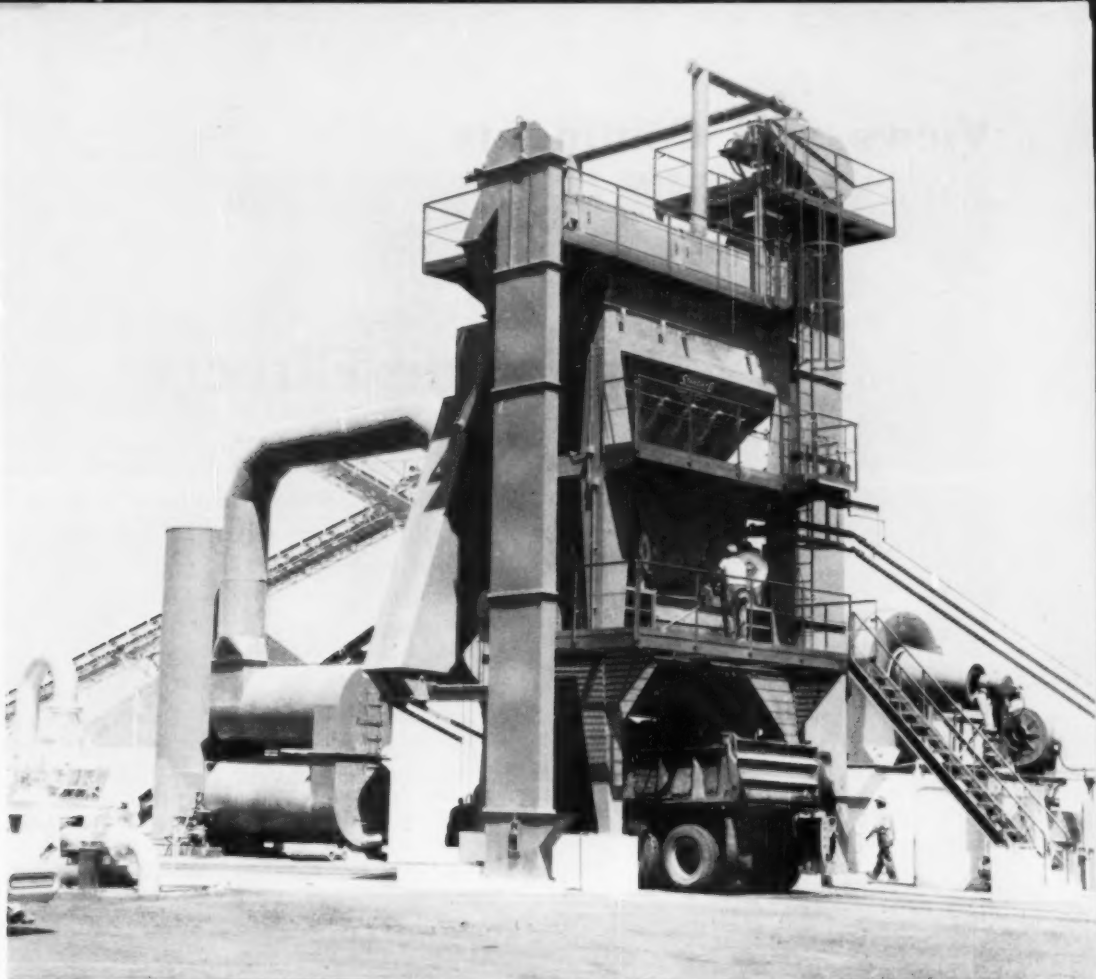
Cited For Good Traffic Engineering

Twelve states, two counties and 72 cities have been recognized by the Institute of Traffic Engineers for traffic engineering performance during 1958.

The states are California, Colorado, Connecticut, Delaware, Illinois, Maryland, Massachusetts, Michigan, Oregon, Texas, Virginia and Washington.

The counties are Arlington County, Virginia; and Dade County, Florida.

The recognition is based on excellence of traffic engineering management, as reported by the Annual Inventory of Traffic Safety Activities, administered by the National Safety Council. The states are those which met or exceeded 90% of the recommended standards, and the counties 85%.



San Jose contractor's new plant: busy first season. One of a Pictorial Series.

Hot-Mix Firm Gears for Growth

Contractors today who serve rapidly expanding suburban areas often have to step up their productive capacity, or be caught short in their growing market. An example of a company which has equipped for growth is A. J. Raisch Paving Company, of San Jose, California.

After operating a smaller plant for many years, this firm recently put in the new plant shown—a Standard Steel Corporation Model R-M 6,000 plant. Components include a Model RM-A 6,000-lb. mixing unit, a No. 836 super-lift dryer and centrifugal wet washing system, designed to meet local rigid air pollution control requirements.

This plant wasted no time flexing its tonnage muscles. By "coasting along" a steady 250 tons per hour in response to various customer and project demand, this plant turned out 120,000 tons of asphaltic mix between mid-June, 1959, when it got going, and October 1, according to Patrick W. Regan, the firm's executive vice-president.

Bituminous Roads And Streets

Bituminous Features Appear Between
Pages 149 through 166.

Views and Comments

By H. G. Nevitt

Subgrade Effects

This points out that loads which are within the elastic limit of the compacted base, may still cause pavement failure due to elastic base deflection. Load bearing test data are recommended as part of the design procedure.

We have previously brought out the importance of a really sound as well as accurate thickness design procedure for flexible pavements, pointed out the groups of variables which are involved, and discussed the first group, the loading factors. This comment is on the principal considerations involved in the second group, namely, the properties of the subgrade or base soil.

If the design is not correct, the properties of this base soil can produce failure in two different ways. One is through displacement of the base soil itself. The other is through the effects of its reaction to the load upon the highway structure above it. Both of these possibilities need consideration, as do the factors which influence the resistance developed by the subgrade.

The base soil itself can only fail through movement. This implies that it has been stressed beyond its ability to withstand shear, assuming that consolidation has been completed.

As will appear in our further discussion, it is essential that the base soil be consolidated during the construction process or early in the life of the road to establish a condition of equilibrium. Practical experience has confirmed this point, and sufficient consolidation during construction is now a general requirement. There are many problems connected with this which we have at times discussed, but for the purposes of this exposition of the ef-

fects of the subgrade, it will be assumed that the construction consolidation has been completed.

If the base soil fails in shear, it is because the pressure differential along the face of the layer is beyond that which the material can withstand. When the material has reached the point where flow occurs, it implies an upward movement at the point of low pressure to compensate for displacement nearby at the point of excess pressure.

If, however, the characteristics of the pavement structure above the subgrade are such as to prevent this upward movement, the load will be carried. This leads to the conclusion that almost any soil will carry extremely large loads provided the pavement structure resists the upthrust resulting from the pressure immediately under the load; or if there is a sufficient surcharge over the sections subject to upward thrust to equalize this pressure.

It should be further noted that the amount of upthrust is determined by the ratio between the vertical and horizontal components when the soil is in equilibrium, such as is determined in the triaxial test.

In addition to this failure by displacement of the base soil itself, which is accompanied by upward displacement of the pavement section and therefore might be instead described as a failure of the structure, the subgrade can cause failure simply due to excessive deflection under load. When consoli-

dation is completed this deflection will be elastic; that is, it can be within the elastic limit of the material, and yet can cause failure in the road structure unless this has sufficient flexibility or corresponding elasticity to withstand the same strain without failure. Often this is not the case, and it is frequently necessary to design pavement structures on the basis of less than the maximum shear resistance of the subgrade soil.

While much attention has been given to this matter of pavement deflections and some excellent work has been done or is under way, there is not too much in the literature concerning the correlation between the properties of the base soil and the deflection which will result in a given structure under the design loadings. In fact, many design approaches do not directly bring this matter of the limiting strain permitted in the pavement into the design, nor are we aware of any method which indicates or predicts the strain to be expected from a given soil by laboratory tests.

This phase of the design problem is one for which field bearing tests are eminently suited, and we suspect that data of this type should be part of the regular procedure in the design process.

What factors influence both the shearing strength and the elasticity of the subgrade? One is obviously

Continued on page 166



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The Simplicity dryer was originally bought to supplement the production of their two single shell dryers. It soon proved that the one Simplicity double shell dryer did the whole job with less effort, far lower fuel cost and a maintenance cost of less than 3c a ton. The single shell dryers have now been on stand-by for three years.

This standard Simplicity double shell dryer outperforms custom units costing several times as

much. It has proven itself in drying all types of mineral aggregates, crushed stone, slag, portland cement, silica sand, sand and gravel. This double shell dryer is noted for its fuel economy. The cold incoming material in the outer shell is partially dried by the heat that is normally wasted in a single shell dryer. This saves fuel and protects the dryer from the destructive effects of heat.

The furnace gases enter the Simplicity dryer around 2500°F. to 3000°F. Actual exhaust temperatures measured at Douglasville, Georgia, on a hot day in June 1959 was 180°F. The heat goes in the material and not in the air. That is why fuel savings are so dramatic . . . in many installations fuel savings alone will pay for the dryer in three years or less.

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Mobile Bituminous Testing Lab in Michigan

Bituminous testing work is being done by the Michigan state highway department using a new field laboratory on wheels. The department's office of testing and research has outfitted the special truck here pictured, as part of its procedure for better quality control. Developed under the direction of W. W. McLaughlin, testing and research engineer and staff, the mobile laboratory is used to supplement conventional field tests, serving often as a "trouble shooter" unit on jobs where special quality control problems arise.

The usual time-consuming routine of sending roadway samples from the site to the central laboratory at Ann Arbor is short-cut with this on-the-spot service. Two technicians man the truck. The equipment includes a portable diamond coring machine for removing roadway samples; a hoist for positioning the coring machine; tank for water; gas stove and oven; and gasoline engine driven generator for powering the various equipment.

The Michigan state highway program includes over 190 miles of dual-lane bituminous expressways, along with an increased mileage of bituminous-mix resurfacing.

Surface Treatment Test Conclusions

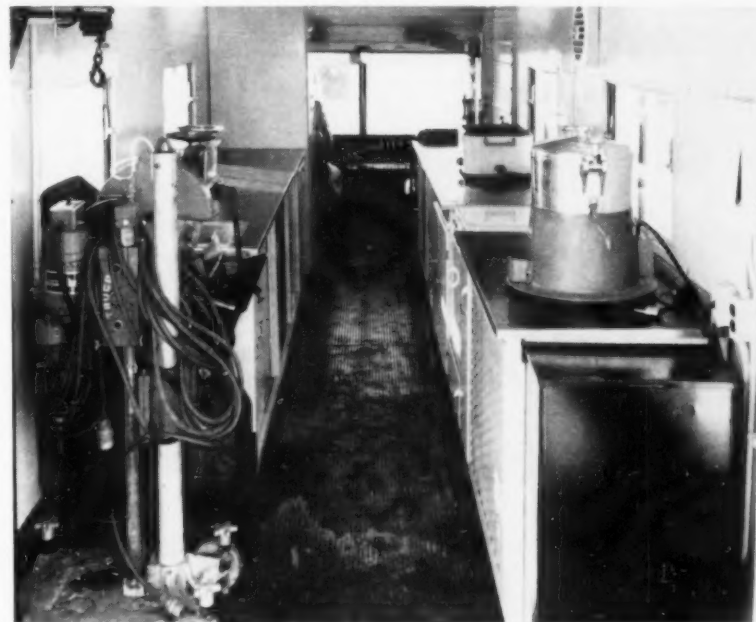
Suggestions for obtaining better durability for asphalt roads have resulted in research that has continued for five years by the Texas Transportation Institute for the Texas highway department.

Laboratory and field studies of the changes in the physical properties of asphaltic materials in a number of test roads are in progress. Findings made to date under supervision of Bob M. Gallaway have provided construction information as follows:

1. Double surface treatments are highly satisfactory when properly constructed.
2. As traffic density and weight increase, base density is increasingly important.
3. Cover stone should be large, probably no smaller than size 5 and it should be considerably more restricted in grading.
4. Heated aggregate for all surface treatments in any kind of



Top: New Mobile testing laboratory of the Michigan state highway department. Bottom: Some of the interior arrangement and equipment.



weather is a very definite advantage and assures a high percentage of successful jobs.

5. For heated aggregates the harder asphalts are preferred (the Texas OA-90's and AO-135's).

6. Stone embedment should be 30 to 50 percent.

7. Pneumatic rollers serve more efficiently than steel rollers for attaching the stone to the asphalt.

8. Loose stone not stuck by the roller should be swept free of the traveled road surface immediately after completion of rolling.

ACCELERATED PAY INCREASES have been given to 116 employees of the Michigan state highway department in the past two years, 67 were for engineers, draftsmen and surveyors. According to the department's personnel director Richard A. Ross the raises have civil service commission OK. Most were given to fill vacant positions with people from outside the state government.

The step-up in pay was considered essential in staffing the department to handle the enlarged construction program.



Surface treatment on Colorado US 24. From left: supply truck from Empire Petroleum Co.; Etnyre distributor, Flaherty chip spreader, tandem roller, repair and welding truck, White truck with chips,

Bituminous Stabilization Saves Costly Material Import

By E. G. Swanson

Staff Materials Engineer,
Colorado Department of Highways

An example of asphalt base stabilization making possible the use of local aggregates is afforded by our recent Project No. F 017-2 (3). This project extends 7.371 miles from Peyton towards Calhan, on Route US 24 in El Paso County. The contractor was Pioneer Construction Company, Pueblo, Colorado, Clarence Brown, president.

Laboratory tests on aggregate from a local pit, 1.5 miles from the project, was suitable for subbase but too fine to meet our standard base course specifications. The nearest source of suitable base course aggregate involved a haul distance of some 30 miles.

Further testing indicated that the aggregate was suitable for use in an asphalt stabilized base and an asphaltic surface course. It was decided that asphalt stabilization of the local aggregate would be a more economical solution than hauling more suitable aggregate a distance of 30 miles.

The typical section shows a 24-ft. roadway with a 10-ft. shoulder on each side. The 4-in. asphalt stabilized base extends from shoulder to shoulder, a width of 44 ft. The



Steel roller, Bros pneumatic roller. This project an example of design adaptation to utilize locally available materials at cost saving.

asphaltic surface course is 24 ft. wide by 1 in. in depth, and is covered with a seal coat. Subbase thickness varied from 4 in. for A-1 and A-2-4 soils to as much as 17 in. for an A-6(11) soil.

Typical gradations of aggregates as obtained from the local pit are shown in Table 1.

Based on Centrifuge Kerosene Equivalent and Stabilometer values, the recommended asphalt contents were 5.0 percent for the asphalt stabilized base, and 6.0 percent for the asphaltic surface source. Asphalt of 120-150 penetration grade was originally specified for both the base course and the surface course.

The 4-in. asphalt stabilized base was placed in one layer by a Cedarapids paver. Before placing the 1-in. asphaltic surface course, the surface of the compacted asphalt stabilized base was lightly indented by the feet of a sheepfoot roller. These indentations, approximately $\frac{1}{8}$ in. deep, provide roughness to interlock the surface course and base. Also, a tack coat was applied before the surface course was laid.

Through the cooperation of

Walter R. Howat, district engineer, the Asphalt Institute, samples of the aggregate were shipped to their laboratory in College Park, Md., for evaluation and recommendations. The Institute recommended the addition of limestone dust or hydrated lime as filler material, and the use of a heavier grade (85-100 pen.) asphalt.

In order to compare the performance of the mixture as recommended by The Asphalt Institute with that of the mixtures set up for the project by our Central Laboratory, two 500-ft. test sections were incorporated into the project as follows:

Section 1: Asphalt stabilized

base; 3 percent limestone dust filler; 5.5 percent asphalt, 85-100 pen. Asphaltic surface course; 3 percent limestone dust filler; 6.5 percent asphalt.

Section 2: Asphalt stabilized base; 2 percent hydrated lime; 6.0 percent asphalt. Asphalt surface course; 2 percent hydrated lime; 7.0 percent asphalt.

The seal coat for the asphaltic surface course represents a recent development by the Colorado department of highways. The same asphalt used for the base and surface course (120-150 pen.) was used for the seal coat. The $\frac{3}{4}$ -in. maximum size limestone chips were heated to 300°-325° F. immediate-

Table 1
Typical Gradation of Local Pit

	Subbase	Asph.-Stab. Base Course	Asphaltic Surface Course
Passing $\frac{1}{2}$ in.	100%	100%	100%
" No. 4	97%	95%	95%
" No. 10	86%	80%	81%
" No. 40	38%	38%	39%
" No. 200	9%	9%	10%



Applying surface treatment over the "black base" using an Etnyre distributor for the RC₃DN material.



Colorado's eastern plains section of US 24, seen following completion of the treatment—a high speed road with base strength ample for frost resistance as well as heavy truck traffic.



Showing good embedment of limestone in the RC₃ DN neoprene rubberized asphalt used for the surface treatment.

ly prior to spreading operation. The heated chips imbed satisfactorily into the freshly applied paving grade asphalt. Asphalt hardens rapidly; no curing problem.

Since the Colorado department of highways has had considerable experience with the use of rubberized asphalt for seal coats, it was decided to place a test section of seal coat using 4,000 gal. of RC-3DN. This type of rubberized asphalt utilizes 1½ percent neoprene for the rubber phase. Since hot chips were available, they were used in the test section. Normally, cold-chips.

The project was completed in August, 1959. To date the indications are that the asphalt stabilized base and asphaltic surface course will perform satisfactorily. Periodic inspections will be made to determine the effect of the variables incorporated in the test sections.

Drying of Bituminous Concrete Aggregates

Rene L. Fischman and Charles A. Pagen. Ohio State University (Columbus 10, Ohio); Engineering Experiment Station, Bulletin Series 173, 1959.

The purpose of the research described was to develop techniques for the most efficient method of operation of aggregate dryers for bituminous concrete plants. From the many mathematical and practical solutions to the heat conduction problem, as found in the literature, the authors selected those adaptable to the particular conditions of the solids constituting the bituminous pavement aggregates, and worked out a practical method for readily determining values of the temperature of the center of some representative common aggregate as a function of the drying time.

The work summarizes the effect of various dryer operating conditions (e.g., temperature, time, air velocity, type, and gradation of aggregate) upon (a) civil engineering aspects of drying bituminous concrete aggregates, (b) moisture gradients during the drying phenomena, and (c) certain physical properties of the tested aggregates; and it shows how the drying data obtained may be used for predicting the operating performance of asphalt dryers being designed.



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Coal Tar Products in Flexible Pavements

As reviewed at the Air Force's Pavement Maintenance Conference at Berkeley.

Delegates to the Air Force's World-Wide Pavement Maintenance Conference, Berkeley, California (July 27-31, 1959) heard a wrap-up on coal tar's place in airfield work.

One of two speakers in this area was Paul Phelan, Technical Director, Road Materials, Tar Products Division of Koppers Company, Inc. Phelan noted the essential differences between coal tar and asphalts of standard grades. The heaviest tar cement (T-12) is comparable in viscosity to 300 pen asphalt; thus, a tar binder used in a hot mix is much softer than the usual asphalt binder of 85-100 pen. Also, one cannot correctly assume that MC-3 and RT-3 have the same viscosity, etc.

Coal tar is chiefly characterized by its penetrating ability through moisture and dust to effect quick and thorough coating, Phelan pointed out. This coating is not dislodged by stripping action of water, or affected by grease, oils or fuel spillage. Particularly for "non-flying" pavements in the military establishment, coal tar is especially recommended for priming new base courses. Favorable characteristics for this use: it penetrates deeply, sets up to stabilize and bind the penetrated layer, is waterproof, and provides a tack coat for construction to follow.

About 10 percent of all road tar is sold for priming purposes. About 50 percent of road tar sales throughout the U.S. however are for surface treatments and seal coats, for runways, taxiways, overruns, shoulders, roads, streets and parking areas. This speaker went into some of the recommended details for surface treating pavements, required to secure good aggregate embedment and minimize or eliminate

danger of flying particles.

Phelan touched on tar concrete as presently covered in Air Force Guide Specification CE-807.12, and he noted the Corps of Engineers Tentative Interim Guide Specification on tar-rubber blends (revised, April, 1959). A recent project using this material consisted of a large apron at Andrews AFB, where a 1/2-in. rubberized tar concrete resurface was placed at a maximum temperature of 225 deg. F. maximum placing heating temperature.

Phelan's concluding remarks went into details of recommended practice which Air Force installations men should know to insure good results in their maintenance programs.

Coal Tar Pitch Emulsions. Interest has grown in the possibilities of coal tar pitch emulsions, as an aid to the preservation and maintenance of asphaltic pavements. The role of this product and the new council was outlined at the Air Force's Conference at Berkeley. The spokesman, Robert A. Tissot, president of Maintenance, Inc., reviewed the contribution that the product could make in maintaining the huge yardages of airfield asphaltic concrete taxiways, runways (outside channelized traffic areas), runway shoulders, overruns, blast pads, aircraft parking and service areas, and grounds pavements.

In recent months four major producers formed the Coal Tar Pitch Emulsion Council, members being The Flintkote Company, Koppers Company, Inc., Lancaster Chemical Corporation, and Maintenance, Inc. The purposes of the council are to adopt and help maintain manufacturing standards organizations, and clarify nomenclature.

In explaining the nature of coal tar pitch emulsion, Tissot pointed out that it is a formulated coal tar

pitch—the heavy residue of coal tar distillation—plus water and a mineral stabilizer. It is a "Thixotropic" substance which upon being thinned from a mayonnaise-like condition by agitation so that it can be applied without heating by brush, squeegee or spray-bar under pressure.

Applied at the Air Force's specified rate of 0.1 gal. per sq. yd. per coat, it dries in about an hour at 50 percent relative humidity and 70 deg. F. ambient temperature. No cover aggregate or seal is required.

The quality that makes the material particularly important for airfield use, noted Tissot, is its imperviousness to water, coupled with resistance to open-chain hydrocarbon derivatives, such as motor oils and fuels. It has a minimum volatilization rate, and by nature practically no oxidation rate. It hence is weather resistant. When mineral-fortified properly to eliminate cold flow, the toughness of a cursed coating is increased, and low temperature flexibility also achieved. Not being sticky at field temperatures, no cover aggregate is required. The material hence is recommended as a low cost protective coating for air field bituminous surfaces.

Mr. Tissot's review noted ASTM Special Publication 94, "Symposium on Accelerated Durability Testing of Bituminous Materials," as presenting laboratory data bearing on the foregoing.

The coal tar pitch emulsion was also recommended as a seal for hot-mix overlays placed over existing portland cement concrete; the purpose being to keep out water and possible frost heave as well as present resistance to oil or fuel damage. For large applications (25,000 sq. yd. or more) contractors should use standard or specialized spray-bar equipment. Drum pump application with hand or pole guns is not recommended for good uniformity.

Correction Please

In the report on the Air Force's Berkeley pavement conference ("Runway Specs, Tough Now, to get Tougher," *Roads and Streets*, September, 1959), statements made by Robert A. Tissot, of Maintenance, Inc., who spoke in behalf of the Coal Tar Pitch Emulsion Council, were erroneously credited to P. F. Phelan of Koppers Company, Inc. Also some of the contents of the two papers were intermixed due to a typographical mix-up.

Highlights from the two papers are given on these pages. Readers desiring the full text can obtain them by writing respectively to P. F. Phelan, Technical Director, Road Materials, Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pa.; and to Robert A. Tissot, President, Maintenance, Inc., Wooster, Ohio.

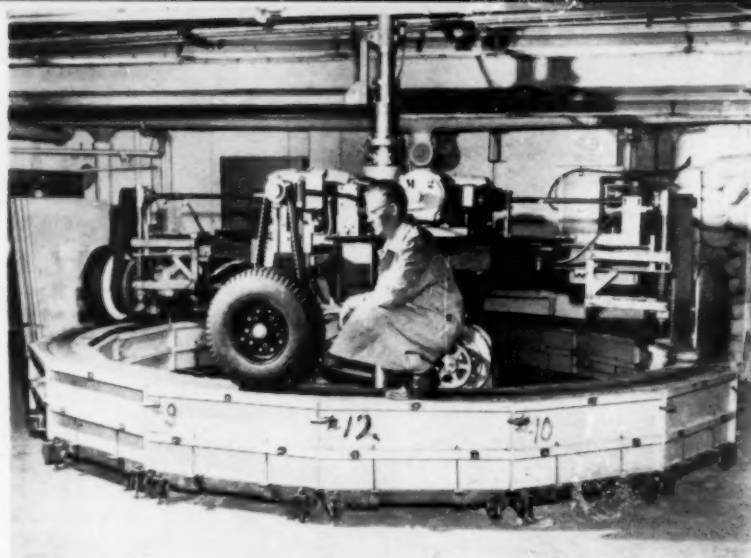
Proceedings of the entire Berkeley Conference have been distributed to all Air Force bases and commands, as well as to all participants of the conference, including the industry representatives. Distribution was made by the Directorate of Civil Engineering, AFOCE, Hq. U.S. Air Force, Washington 25, D. C.

A second 0.1 gal. application is suggested around fuel hydrants, etc., for a 0.2 gal. total application. If a third coat is added, its purpose would be chiefly to seal pin holes in previous membranes.

As a result of inspecting some 6 million square yards of military applications of coal tar pitch emulsion, Mr. Tissot noted some defects in procedure, all easily corrected. These are inadequate cleaning of the pavement; not replacing oil or fuel saturated pavement areas with new bituminous material before sealing; sealing over bituminous patches not adequately compacted and surface-cured; or over pavement that is fatty and unstable; disregarding ordinary weather limitations (rain, freeze during application and curing time).

Miniature Asphalt Road Test Track

Standard Oil Company (Indiana) has unveiled a miniature test-tube highway at its Whiting laboratory. Designed to help asphalt scientists pave the way to multi-million-dollar savings on road construction, it consists of a circular track 12 in. wide and 44 ft. in circumference.



Tom L. Speer, senior engineering research supervisor for Standard Oil Company (Indiana), working with newly developed indoor road tester.

Actual highway traffic conditions can be simulated as to speed, load, or weather. The equipment was devised by Tom L. Speer, a senior engineering research supervisor to make accelerated studies of roadway materials and designs involving traffic.

The results from this type of research, according to Standard, have yielded valuable information. Speers has been able to demonstrate ways to improve highways by:

- (1) Using paving asphalts made from new crude sources and by experimental processing techniques, but not yet accepted for highway construction.
- (2) Improving refinery spot testing of roadway asphalts.
- (3) Discovering effective new methods for reinforcing asphaltic slabs.
- (4) Turning up evidence about the effectiveness of various proposals to minimize reflection-cracking and chuck-holing in the thin asphaltic overlays now used to rejuvenate worn concrete roads.

SUBGRADE EFFECTS

continued from page 150

the nature of the soil itself. A sandy material of reasonable moisture content—that is, one in which the voids are not completely filled by water—may show a low shearing resistance due to lack of friction between the particles but it will probably not show much elasticity nor change in these characteristics as the moisture content varies. A clay soil, on the other hand, will change

markedly in both these properties as the moisture is varied. What is really needed then are the characteristics of the soil at the maximum moisture content which can be anticipated during the design life of the load structure. This implies that we must know this moisture content. When we have it, we can readily find the shear resistance, and the elastic properties of the material by suitable measurements.

This is undoubtedly one of the great problems in this matter of proper thickness design. One approach is to subject the soil to severe moisture exposure and design on the basis of the resultant properties. Unfortunately, this approach, when strictly followed, is often unrealistic, calling for an extremely heavy road structure when actual use will show that nothing like the extreme moisture condition assumed will actually ever be experienced, so that the road is correspondingly badly overdesigned in these sections. Another approach is to attempt to predict the probable saturation conditions on the soil properties. This is certainly a better approach, but it fails to take care of the factor of exposure—that is, climate and the other characteristics of the particular road section which will determine the optimum moisture content that it will be likely to attain. In our view, it is doubtful if a routine laboratory road design technique can completely replace extended field observations of previous roads in the area, the engineer's estimate of lo-

cal conditions, and in general the use of individual judgment rather than a design formula alone in estimating the correct design condition to be assumed for the stability tests in the laboratory on the subgrade soil.

It will be again noted that the problem of estimating the deflection under load of the subgrade soil may cause trouble. Assuming that we can estimate the ultimate moisture content and make a laboratory determination of the shearing resistance (stability) and elasticity of a soil specimen at this moisture content, we still must determine the total subgrade deflection under any given loading to be anticipated in the road. Plate bearing tests can determine this for the soil in place, but this will rarely be at the design moisture content. Attempting to change this condition by moisture applied to the undisturbed soil or by raising the moisture content through reworking the soil have obvious difficulties which need not be discussed here. Possibly some correlation between the plate bearing tests at the test moisture content, the elasticity of the compacted soil at this moisture content, and its elasticity at the design moisture content in laboratory specimens can be worked out in time to throw some light on this important point in the design process.

It is probably in his observance of the base soil conditions and the factors which are influenced by it that the highway engineer not directly concerned with design or research but in a position to observe the results from actual roads in use can be most helpful. Obviously, a continuing record of subgrade soil moisture content along with the properties of the soil at this moisture level, and the deflections shown by the road structure under known loads will be important data in the analysis of any failures that occur on such a project. This data is particularly important due to the light it will eventually throw on the trend of moisture content, as it will supplement the present (and considerable, yet insufficient) information already accumulated in this respect.

DAVID A. PEASE has been appointed by Hyster Company as manager of the firm's News Bureau, located at the home office in Portland, Ore.



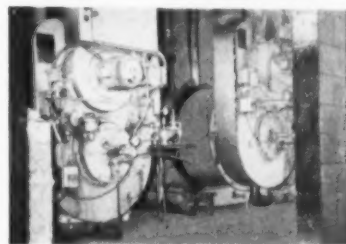
Keeping asphalt flowing from barge to truck

Kentucky Asphalt Sales Company — owner of South's largest marine terminals — expands with Cleaver-Brooks Peak-Temp oil heaters and packaged boilers — dependable heat for coordinated plant operation

Heat is basic to Kentucky Asphalt Sales Company's system of barge-to-truck asphalt handling. That's why Cleaver-Brooks equipment was *again* the choice for heat at their huge, new Kentuckiana (Louisville) terminal. Cleaver-Brooks heaters proved outstanding in heating over 19,000,000 gallons at Margene Terminal, Eddyville, Kentucky.

Asphalt is brought in from the refinery on barges. Dockside, it is heated and transferred via elevated, steam-jacketed pipes to storage tanks. From transfer tanks, asphalt is pumped into tank trucks which deliver asphalt, hot, to jobs within a 300-mile radius of Louisville. All the way—winter and summer—Cleaver-Brooks Peak-Temp heaters and boilers keep asphalt hot and on the move. Peak-Temp oil heaters are forced-

circulation type, fully automatic. They heat up to 450 F at low, safe pressure. Heat transfer oils they use will not freeze nor do they create pressure problems. For full information on this versatile heater and CB packaged boilers, write Cleaver-Brooks Company, Dept. P, 395 East Keefe Avenue, Milwaukee 12, Wis.



TWO PEAK-TEMP OIL HEATERS maintain pumpable temperature of 175 F in large storage tanks. Asphalt is heated to temperature as high as 325 F within transfer tanks.

Cleaver Brooks
ORIGINATOR AND LARGEST PRODUCER
OF PACKAGED BOILERS

... for more details circle 290 on enclosed return postal card

Manufacturers' Literature

CRAWLER SHOVEL-CRANE: A 24-page catalog describing their 40-ton crawler crane-excavator, has been released by the American Hoist & Derrick Company, 63 S. Robert, St. Paul, Minn. The catalog describes and illustrates many exclusive time-saving features claimed by the company on the 500 series crawler. Designed for operation with tracks extended for work or retracted for loading, the unit easily converts to a crane, dragline, clamshell, shovel, backhoe, pile driver or for special grapple work.

For more details circle 191 on Enclosed Return Postal Card.

STEEL ROAD FORMS: A new 4-page bulletin (no. 59165) on Rex steel road forms has been published by the construction machinery section of Chain Belt Company, Sales Promotion Dept. Milwaukee 1, Wisconsin. The publication illustrates design and manufacturing features in the all-welded steel forms that are said to assure peak load-carrying ability, resistance to twist, strain and fatigue, and maximum reuse service. The bulletin also carries selection data and information on form accessories.

For more details circle 192 on Enclosed Return Postal Card.

CRAWLER TRACTOR: A new 14-page catalog (MS-1318) covering the Allis-Chalmers HD-16 crawler tractor powered by the recently introduced Allis-Chalmers 16000 engine, is available from the Construction Machinery Division, Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis. Featured in the catalog is a fold-out cutaway view of the HD-16 with descriptive marginal notes. Illustrations also include a cutaway of the 16000 diesel engine's combustion chamber, of the unit's track release mechanism and the new hydraulic dozer control unit. Matched equipment that fits the HD-16 to special jobs is also pictured and described.

For more details circle 193 on Enclosed Return Postal Card.

WASHING PLANTS: An informative 8-page bulletin describes the new line of Hydro-Screen washing plants pro-

duced by Pioneer Engineering, Division of Poor & Company, Inc., Minneapolis, Minn. The bulletin illustrates the company's new "Hydro-Screen" principle of washing and screening aggregates, a drawing of the basic plant and drawings of several different models of the plant designed to meet specific aggregates washing problems.

For more details circle 194 on Enclosed Return Postal Card.

JOINT COMPOUNDS: Two new single page description sheets list data and specifications of cold applied Carey Sewertite Asphalt Base and Tar Base Joint Compound for sewer pipe, culvert and septic tank joints of concrete, vitrified clay and tile and are available from the Philip Carey Mfg. Co., 320 S. Wayne Ave., Lockland, Cincinnati 15, Ohio. Condensed information includes: product description, uses, features; performance data regarding non-volatile matter, inorganic filler, chemical resistance, workability, condition in container and application. Tabular guide lists coverage for tongue and groove pipes from 12 in. to 108 in. and bell and spigot joints from 4 to 26 in.

For more details circle 195 on Enclosed Return Postal Card.

BATCHING EQUIPMENT: Cab-operated push-button control panels, side-mounted trippers, hydraulic stabilizers and levelizers are included among the engineering features of the Galion batching equipment for paving contractors. These features are described and illustrated in a new booklet published by the Galion Allsteel Body Company, Galion, Ohio. Illustrated in a step-by-step action sequence the booklet shows how a driver can pull in and out of the skip with the truck body raised, and trip the batching partitions from inside the cab.

For more details circle 196 on Enclosed Return Postal Card.

10-YD. HAULER: The model 100 Dumptor, a 10-yd. capacity off-road hauling unit, is the subject of a new bulletin available from the Koehring Division of Koehring Company, 3026 W. Concordia Ave., Milwaukee 16, Wis. The two-color, 8-page bulletin features

on-the-job views, component parts blow-ups, and drawings to illustrate and describe the machine's two-way controls, instantaneous gravity dump (and controlled gravity dump).

For more details circle 197 on Enclosed Return Postal Card.

WELDING POWER SOURCES: Reprints of an article on arc welding power sources entitled "Which Welding-Power Source Should You Use" are available from Air Reduction Sales Company, A Division of Air Reduction Co., Inc., 150 East 42nd Street, New York 17, N. Y. Reprinted from the March 26th issue of "Iron Age", this eight-page article was authored by C. A. McClean, Airco process engineer. It offers a comprehensive guide to the proper selection of arc welders for use with the stick electrode, gas shielded tungsten-arc or gas-shielded metal-arc welding processes.

Illustrated with 14 schematic drawings, the article details eight specific steps to be taken into account when choosing one of the four basic types of power sources.

For more details circle 198 on Enclosed Return Postal Card.

Slusher Hoists

Medium capacity, 15 to 40-hp slushers are the subject of a new bulletin by Joy Manufacturing Company, Oliver Bldg., Pittsburgh 22, Pa. These two- and three-drum haulers are designed for continuous heavy-duty operation. Designated Joy A and B Class slushers, they feature fully self-energizing clutches and automatic brakes for operating ease. Other features include large, exposed clutch bands for cooler running, longer life, and simple adjustment; simplified lubrication and rugged, one-piece steel base. Also described are three different types of remote control systems for Joy slushers. Ask for Bulletin 76-J.

For more details circle 199 on Enclosed Return Postal Card.

LIQUID FLUX AND FEEDER: A new four page brochure on the "Rexarc Twin Liquefluxers and Liqueflux," new products of the Sight Feed Generator Co., West Alexandria, Ohio is available without charge.

The brochure is designed to answer questions regarding the varied applications in the brazing process. No special torch is needed for using "Liqueflux". The flux in the flame cleans and fluxes the parent metal for brazing, as the flame contacts the metal. Therefore, no pre-cleaning is required, manufacturer states.

For more details circle 200 on Enclosed Return Postal Card.



SWENSON SPREADERS for ICE CONTROL and RESURFACING

Handle all granular materials . . . salt, cinders, sand, calcium chloride, rock chips. Lay narrow strip or full traffic lane. Speeds to 30 M.P.H. Steady or intermittent for hills and intersections. Hydraulic and mechanical control. Write for complete information.

SWENSON SPREADER & MFG. COMPANY

Lindenwood, Illinois

... for more details circle 337 on enclosed return postal card

Manufacturers' Literature

POWER SHIFT TRANSMISSION: Working details and mechanical relationships of the power shift transmission, recently introduced by Caterpillar Tractor Co., Peoria, Ill., are explained and illustrated in a recent booklet. Making use of "exploded" and schematic drawings, the book shows the flow of power from the engine through the two sets of planetary gears and the torque converter. Also explained is how the best features of both direct drive and torque converter equipped tractors are utilized to obtain higher efficiencies and greater production.

Power shift transmissions, available for both the Cat. D9 Series and D8 Series H Tractors, are said to maintain a constant and efficient flow of power to the tracks by making use of direct drive and torque converter. Engine output is "split" by a planetary mounted on the flywheel, with part going directly to the three speed planetary transmission and part working through the torque converter. By this means, engine output is constantly adjusted to the work load. Also, gear selection lever is mounted next to the operator's left arm rest; positive spring action releases the clutch discs allowing instant change of direction, the manufacturer states.

For more details circle 159 on Enclosed Return Postal Card.

CALCIUM CHLORIDE SOLUTION PREPARATION: A pamphlet is available from the Calcium Chloride Institute, 909 Ring Building, Washington 6, D. C., on "How To Prepare Standard Calcium Chloride Solution." Prepared especially for ready mixed concrete producers, it contains illustrated recommendations for procedure in making solution, and a chart on recommended gallons of solution per batch. It includes information of proved commercial and shop-made automatic dispensers.

For more details circle 160 on Enclosed Return Postal Card.

FLUORESCENT FLOODLIGHTS: Bulletin GEC-1487B, six pages, describes General Electric's line of "Fluoroflood" fluorescent floodlights for billboards, loading areas, highway guide signs, service areas, building fronts and minor sports areas. New rotating junction box which allows 360° aiming is diagramed and calculated light distribution and photometric data listed. Suggested mountings and ordering information also given. General Electric Co., Schenectady 5, N. Y.

For more details circle 161 on Enclosed Return Postal Card.

SAFETY GOGGLES AND LENSES: Safety Products Department, Bausch & Lomb Optical Co., Rochester 2, N. Y. announces Catalog A-1762 which lists the company's complete line of safety products for industrial and laboratory job requirements. The 40-page book includes descriptions of plastic, metal, and combination safety glasses; specially designed goggles and eye shields; and complete specifications for "Bal-Safe" lenses and the new "Enduron" plastic lenses. There is additional information on B&L vision testing instruments, the new "Quiet Ear" protector, and a line of safety eyewear cases. Each item is clearly illustrated by product and "in use" type photos. A specially indexed price list is included.

For more details circle 162 on Enclosed Return Postal Card.

A NEW BOOKLET ENTITLED, "COMPRESSED AIR FUNDAMENTALS," has been published by Ingersoll-Rand Company, 11 Broadway, New York 4, N. Y. This informative piece of literature was produced to help in the selection of a small "packaged" air compressor for either automotive or industrial application. The booklet also basically describes compressed air, how it is compressed, single and two-stage compressors, piston displacement actual delivery, unloading of compressors, regulation and types of control used. Other material included is information on compressor oils, pipe sizes, wire sizes and terminology and definitions used in connection with the compression of air.

For more details circle 163 on Enclosed Return Postal Card.

DIRECTORY OF FORD TRUCK DEALERS: The availability of a new directory listing all Ford heavy duty truck dealers throughout the nation is available from the Ford Division of Ford Motor Co., Rotunda Dr. at South Field Rd., P. O. Box 608, Dearborn, Michigan. This 27-page directory offers operators a complete and ready reference for both sales and immediate service on all heavy duty Ford trucks.

For more details circle 164 on Enclosed Return Postal Card.

TRACTOR SHOVEL: A specification bulletin explaining features of the new Model 204 Trojan tractor shovel has been released by the Trojan Division of The Yale & Towne Manufacturing Company, Batavia, N. Y. Of interest to bulk material producers and contractors is the fact that the "Trojan 204" has three interchangeable buckets, which give the machine a carrying capacity of from 1-1/2 to 2-3/4 yd. The 2-page bulletin lists standard and optional equipment for the unit.

For more details circle 165 on Enclosed Return Postal Card.

REDUCED VOLTAGE STARTERS: The General Electric Company, Schenectady 5, N. Y., has issued an 8-page bulletin containing a reduced voltage starter selection table and a comparison table for determining starters best suited to individual needs. Photos with individual part callouts are included for the manual autotransformer, magnetic autotransformer, primary resistor and part winding starters.

Typical schematic connection diagrams are included with a brief explanation of construction. Also published in the bulletin is a list of modification kits available for reduced voltage starters.

For more details circle 166 on Enclosed Return Postal Card.

George stopped it . . .

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Manufacturers' Literature

BUYER'S GUIDE: A buyer's guide, outlining three different guarantee programs available for purchase of used equipment, has been prepared by Caterpillar Tractor Co., Peoria, Ill. The two-color, eight page booklet is entitled "Get Guaranteed Satisfaction." In addition to illustrating a number of jobs where used machinery is commonly employed, the booklet describes three different programs—"Bonded Buy", "Certified Buy" and "Buy and Try" offered by Caterpillar dealers. It is available through Caterpillar dealers or by writing for Form Dg23.

For more details circle 167 on
Enclosed Return Postal Card.

SAND, GRAVEL PROSPECTING: Practical data on theory and application of methods for using earth resistivity in prospecting for sand and gravel deposits, as well as underlying rock formations, is contained in a new article written by Howard E. Barnes, Assistant Director, Testing Laboratory Division of the Michigan State Highway Department, and offered by Associated Research, Inc. of 3777 W. Belmont Avenue, Chicago 18, Ill. Detailed analysis is given of methods for preparing subsoil profile contours that indicate location of sand and gravel deposits without the use of extensive borings.

For more details circle 168 on
Enclosed Return Postal Card.

FORK LIFT TRUCKS: A 24-page booklet entitled "What Makes It Tick?", released by Towmotor Corporation, 1226 E. 152nd St., Cleveland, Ohio, describes

the increased operating efficiency, greater driver comfort and handling ease provided by a new "Stream-Liner series" of fork lift trucks. Described in the booklet are many new design features incorporated into the lift truck models such as a lowered cowl which gives the operator full vision of the forks on either sides, a new "direct view" instrument panel and a treadle-type accelerator that cuts driver fatigue, according to the manufacturer. All operating controls on the newly styled units simulate those used on motor cars to simplify operator training and use.

For more details circle 169 on
Enclosed Return Postal Card.

PRESTRESSED STRAND: A new 12-page brochure on Laclede 7-Wire Strand for prestressed concrete has been published by Laclede Steel Company, Arcade Bldg., St. Louis 1, Missouri. The brochure follows each step of the strand-making operation, from charging of the open hearth furnace through tapping, teeming, blooming and wire drawing to stranding and reeling. Also illustrated are operations in prestressed concrete manufacturers' plants, and several example of construction projects using concrete structural members prestressed with Laclede strand.

Also included are elongation curves on $\frac{3}{8}$ in. and $\frac{7}{16}$ in. diameter prestress strand, and A.S.T.M. specification for strand of diameters from $\frac{1}{4}$ " to $\frac{1}{2}$ ".

For more details circle 170 on
Enclosed Return Postal Card.

SEMI-TRAILER: A brochure on their

Model GTRY semi trailer has been released by Transport Trailers, Inc., 1200-34 Twelfth Street, S. W., Cedar Rapids, Iowa. Listing features and specifications in terms of their importance to the contractor and heavy hauler, this brochure explains the trailer's main components such as removable gooseneck, triple axle and low bed. Capacities range from 35 to 75 tons. Special platform styles, lengths, and widths and higher capacities are available.

For more details circle 171 on
Enclosed Return Postal Card.

VIBRATION CONTROL: Publication of a comprehensive technical manual to assist engineers in solving objectionable vibration and shock conditions with "Sorbtex" preformed fabric neoprene and rubber pad materials, has been announced by Voss Engineering, Inc., 5649 N. Ravenswood Ave., Chicago 26, Ill. The Sorbtex Manual contains a complete set of reference charts and text developed by extensive laboratory tests. The company reports that many new concepts in the use of "Sorbtex", a non-linear type of isolator, are presented for the first time.

For more details circle 172 on
Enclosed Return Postal Card.

FORK LIFT TRUCKS: New engineering developments, construction and operating features related to the heavy-duty line of fork lift trucks manufactured by Gerlinger Carrier Company, Dallas, Oregon, are pictured and described in a new booklet on materials handling equipment. Lift truck components outlined in the new manual include heavy-duty industrial-type engines, specially engineered for stop-and-go driving involved in materials handling applications; plus other features.

For more details circle 173 on
Enclosed Return Postal Card.

REINFORCING BAR PLACEMENT: A new 281-page book, published by the Concrete Reinforcing Steel Institute, 38 S. Dearborn St. Chicago 38, Ill., contains complete information on how and where to place reinforcing bars in concrete construction. The book is available in a handy pocket-size edition, and contains valuable information and many practical hints in reinforcing bar placement not available in textbooks, it is said.

The manual, which was prepared under the direction of the Engineering Practice Committee, Concrete Reinforcing Steel Institute, was originally written as a guide for apprentice and journeyman bar setters. It was then expanded to include vital information for engineers, architects, contractors and field inspectors, as well. It will also be a valuable aid to teachers and students of architecture and engineering.

For more details circle 174 on
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x 15' high, curved top, for single tube
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- 4—Collapsible inside forms 40' long x 30' wide
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Capacity: 40 Tons Moving Load on Each
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125	ANY	Cummins	HRIS-600	1800	2
125	120-208	P & H	687CFS	1800	2
125	ANY	International	UD-24	1200	1
120	240-480	G. M.	6-71	1800	3
120	ANY	Hercules	DFXH	1800	1
100	480	Cummins	HRIS-600	1200	2
75	120-208	G. M.	6-71	1200	3
75	240-480	Euda	844	1200	1
37½	240-480	Euda	317	1800	1
20	120-208	Caterpillar	D-3400	1200	1

ALSO MANY GASOLINE DRIVEN GENERATORS—AC OR DC

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BARGAIN

PIPELINE EQUIPMENT

FOUR (4) Used Caterpillar Model D-8 Tractors, 2U Series, equipped with Trackson Model MD-8 Side Booms, located at Dodge City, Kansas. Fair Condition.

AS IS—WHERE IS\$9,500.00

ONE used Caterpillar Model B-8 Tractor, 1H Series, equipped with Trackson Model MD-8 Side Boom, located at Albuquerque, New Mexico. Good condition.

BUY AND TRY\$8,000.00

ONE Caterpillar Model D-6 74" Tractor, equipped with Trackson Model MD6 Side Boom, Trackson Model AF-6 Angelfiller, 14' boom. Guaranteed Machine. Located at Albuquerque, New Mexico.

CERTIFIED BUY\$12,500.00

TWO (2) Used International Model TD-14 Tractors, complete with Cardwell Side Boom attachments. One Tractor equipped with angelfiller. Both in operating condition. Located at Albuquerque, New Mexico.

Tractor with boom and angelfiller
\$5,500.00

Tractor with side boom attachment only
(no boom)\$3,700.00

TWO (2) Hyster Model DBN Worm Drive Winches, complete with power take off shafts, control levers. Good Condition. Located at Albuquerque, New Mexico.\$2,300 Each

R. L. Harrison Co., Inc.

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3—TDT Euclid Scrapers\$30,000.00
(For the three)

2—LeTourneau Scrapers\$8,500.00 ea.

1—Model 1201 Lima Dragline

1—Model 80D Northwest Shovel and Drag.
(New in 1957)

1—Model 80D Northwest Shovel, 1951.

1—Model 6 Northwest Shovel and Drag.
New in 1956.

EUCLIDS—Rear Dump. Low hrs.

1—Model 1055 P&H Shovel—3½ yd. New
1956.

1—Model 120B Bucyrus-Erie Shovel—5 yd.
2—FDT EUCLIDS, Bottom Dump. \$6,500.00 ea.

"Other Bargains available, not listed".

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P&H long booms, wide long crawlers, diesel
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2 yard Front End Loaders

2 1/2 yard Combination Shovel, Crane, Dragline

1 yard Basic Machine with Shovel or Hoe Front

7 ton Self-propelled Crane (excellent for material handling)

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P&H 955A, 2 1/2 cu. yd. shovel, crane and dragline combination, 100' boom, diesel, late 1956 model.

Lorain Model SP-107 self-propelled wagon crane, 8 ton, 4-wheel drive and steer, 25' boom.

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(2) Cat D7's, 75 dozers, 3T and 7M series. Excellent.

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Used Model 25 Northwest 3/4 yard shovel with diesel engine.

Used Model 6 Northwest 1 1/2 yard shovel with diesel engine.

4—Used Model 46TD Euclid 22 ton rear dumps with Cummins diesel engines.

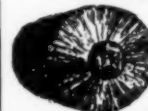
Used D-2 Caterpillar tractor with 1/2 yard front end loader.

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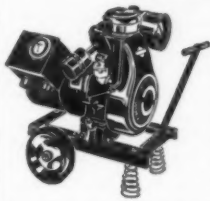
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* **ITEM #667** - Portable 3 KW DC power plant on wheels. Easy to move from job to job. Plenty of output for contractors, builders, etc., to operate lights, heaters, AC, DC universal motors, portable saws, drills, floodlights, chain saws, etc.
* Engine is 6 h.p. Standard Wisconsin. Generator rated 3000-watts, 115-volts, 28.5-amperes direct current. Other features are voltmeter, field rheostat, outlets and overload protection. Size 28" x 21" x 34". Shipping weight 300 lbs. Cost Gov't \$435.00. **SALE - F.O.B. \$169.50**

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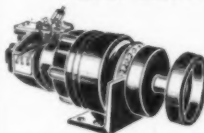
* **ITEM #716** - Western Electric dial transmitter and receiver. Clear tone bell. Excellent extension phone or extra phone on private automatic system. Same type used throughout nation. Size 9" x 8" x 6". Shipping weight 8 lbs. Original Cost \$29.50. **SALE - F.O.B. \$10.39**

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* Top buy in ball-bearing, all bronze, high efficiency centrifugal pumps. Now made available at less than cost of manufacture.
* **ITEM #200** - Brand new Model R-200 bronze, ball-bearing, high capacity centrifugal. Contractors use for draining, dewatering, filling tank trucks, irrigation, etc. Capacity to 280 g.p.m. Pressure to 35 lbs. Clockwise rotation. Complete with 6" pulley. Inlet 2 1/2", discharge 2". Dimensions: 9" dia., 11" ht. Weight 40 lbs. List \$102. **SALE - F.O.B. \$49.50**

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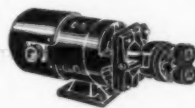
* **ITEM #311** - Cuts truck loading time in half. Use on dumps, machinery hoist, jeeps, cars, to pull out of mud, etc. Save hundreds of dollars in labor.
* Operates on 6 12 volt storage battery. Powerful, fully reversible, ball-bearing winch.
* Load capacity at 6 volts, 1000 lbs.; at 12 volts, 2000 lbs. Holds 40 feet of 1/4" cable. Cable speed 8 to 15 feet per minute.
* Dimensions: 7" high, 9" wide, 17 1/2" long. Weight 49 lbs. Cost Gov't \$280. **SALE - F.O.B. \$46.71**

20 FT. 1 1/4" WATER HOSE WITH FITTINGS



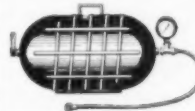
* **ITEM #217** - Brand new surplus water hose. Spiral wire interwoven with strong mesh braid provides strong reinforcement, and makes this ideal for suction or discharge hose. Inside diam. 1 1/4", male 1 1/4" pipe thread fittings on each end. Pressures to 75 p.s.i. Wt. approx. 12 lbs. Cost Gov't \$16.50. **SALE - Ppd. in U.S.A. \$7.69**

ELECTRIC HYDRAULIC PUMP



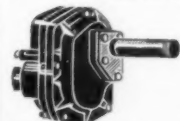
* **ITEM #920** - Brand new Pesco electric hydraulic gear pump. Excellent for use on lift trucks, loaders; other hydraulic applications.
* Operates on 12 to 24-volts DC. 1000 p.s.i., 3-g.p.m. @ 24-volts. Built in relief valve, ball bearings. Motor 2 1/4 h.p. @ 24-V. Inlet and outlet ports, 3/4" - 1/4 female threaded. Size 15" x 7" x 6". Shipping weight 35 lbs. Cost Gov't \$175.00. **SALE - F.O.B. \$16.95**

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* Wonderful buys in Gov't. light weight air tanks. Use for portable fire inflator (fill any service station.) Also useful blowing dust, spraying liquids, etc. 400 lb. rating.
ITEM #472 - Contractors Pressure Unit. Consists of stainless steel tank 10 x 15 with Schrader valve, pressure gauge, tire chuck and blow gun. Hundreds of uses. Inflate tires - blow dust from machinery. Wt. 12 lbs. Cost Gov't \$33.50. **SALE - F.O.B. \$14.95**
ITEM #447-A - 6x24 500 cubic in. 4.95
ITEM #448-B - 10x18 1000 cu. in. 10.91
ITEM #448-C - 12x24 2100 cu. in. 16.95

GEAR SPEED REDUCER



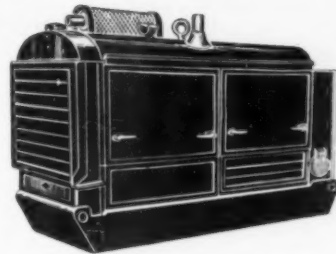
* **ITEM #1310** - Gear reduction unit gives amazing torque and power to drive small winches, slow speed power tools, augers, drills, revolving signs, door openers, etc.
* 80 to 1 reduction gear reduces standard, electric motor to 21 r.p.m. Input shaft 3/8" diam. Output shaft 1 1/4" diam. 6 steel gears, 8 roller bearings. Size 6 1/2" x 6 1/4" x 4 1/2". Shipping weight 5 lbs. Cost Government \$66.00. **SALE - Ppd. in U.S.A. \$8.98**

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* **ITEM #668** - New condition, guaranteed perfect. Each plant has been tested and adjusted and is ready for operation. Army's deluxe heavy duty plant. Weatherproof housing equipped with adjustable shutters. Heavy skid base. Can be set up anywhere.
* 7500/10,000-watts, 120/240-volts, 60-cycles, 1-phase, 3-wire, 4-cylinder Continental water-cooled gasoline engine with governor, magneto, oil filter, air filter, etc. Pushbutton starting. Ball bearing generator. Automatic voltage regulation. Fully equipped instrument panel has voltmeter, ammeters, frequency meter, circuit breaker, oil pressure gauge, water temperature gauge, outlets, many other features, etc. Size 72" x 42" x 24". Weight 1585 lbs. Cost Government \$1950.00. **SALE - F.O.B. \$625.00**

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* **ITEM #574** - Compact, powerful battery operated gear motor. Torque equivalent to 2-h.p. Wonderful for making hoists, winches, raise or lower ramps, elevators, operate levers, build electric personnel cars, golf carts, wagon unloaders, etc.
* Operates on 6 or 12-volt battery. Will operate on AC through transformer. Ball bearing equipped, fully reversible. Heat treated precision gears. Gear ratio 28 to 1. Output speed 240 r.p.m. @ 6-volts, 360 r.p.m. @ 12-volts. Shaft 3/8" diam., 1 1/2" long. Size 15" x 6". Shipping weight 30 lbs. Cost Gov't \$175.00. **SALE - F.O.B. \$14.82**

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DIAMOND PORTABLE CRUSHING PLANT, with 10 x 24 roller bearing jaw crusher, 24 x 16 roller bearing roll crusher, V belt drives, powered with D-8800 Caterpillar diesel, with win Disc clutch, 3' x 10' double deck screen, swivel feed conveyor, return wheel hopper and plate feeder mounted on tandem rear duals, with front dolly. Tire size, 8:25 x 25.

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PSH MODEL 255 3/4 YD. CAPACITY CRAWLER MTD. DRAGLINE, CLAM-SHELL CRANE, w/ Owen Clam shell bucket, 40' boom, powered w/Waukesha 6 cyl. gas engine, crane rebuilt.

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ROCK DRILL PORTABLE W/ TWO CLEVELAND JUMBO ROCK DRILLS for vertical or horizontal drilling, w/ 600 cu. ft. LeRoi Compressor mtd. on International TD-24 crawler tractor.

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CATERPILLAR D-7

Serial 3722277, hydraulic straight dozer, D7N Hyster winch, condition very good.

Both machines are available and are priced to sell.

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7—1952 Ford F-8 Tandem Trucks with 10 x 20 rubber, Ransome 5 yd. mixers, 6 1/4 agitate. In excellent condition. \$3700 each.

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10—14 yd. Tandem Dump Trucks, 10 x 20 tires, Ford F-8's, 8 - 1956 models, 2 - 1955 models, in most wonderful shape.

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1—Brand New Fuller Kenyon Air Pump System, in the original crates, never touched, complete down to the starters and switches, save 35% from new cost. ACT NOW.

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Unload cement by air, convey cement from trailer into bin, 110 bbl. in 20-30 min. Complete kit with diffusion chamber, long term elbow, 4" pipe, 8" vent, mounting brackets, flanges, gaskets, inlet cap, 50' pipe. \$395.00

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A new system consisting of new revolutionary 3 lobe Rotary positive blower 14 psig, air lock feeder, drives and sheaves, relief valve, mount it beneath a hopper, silo, pumps cement at high rate to any point in your plant. Throw out those defunct bucket elevators and screws. Complet kit with motor base and platform \$2,495.00

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Model 50 Link Belt w/UD9 INC. Engine, Shovel Front 45' Crane Boom 1/2 yd. Drag-line Bucket \$7,500.

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Universal TD24 Portable Gravelmaster, 1024 R.B. jaw, 24" twin roll, 3x10, 3½ deck screen; rotovator. In perfect condition. 200 TPH.

Universal TDS-30 Portable Screening & Crushing Plant, 30" twin dual roll, 3x12—2½ deck screen, rotovator, 30" conveyors, Cat Diesel.

Grundler Portable Hammermill Plant, 3XB Mill, Apron feeder, 3x6 screen, Cat. D8800 Diesel. \$8,500.

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Rex 6 Yd. Adjusta-Wate Mixer, flush tank, Chrysler power, on International LF190 tandem—new 1953—ready to go, (2).

Rex 5 Yd. Mixer, flush tank, Chrysler power, on 1955 GMC 620 tandem, air brakes. Rebuilt.

Rex 3½ Yd. Mixer, large tank, Chrysler power on International LF174 5-speed, 3-speed, perfect.

Smith 4½ Yd. Mixer, small water tank, Continental power, open end, good shape—late model.

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1—Lorain "TL-25K" ¾ yd. Diesel Dragline, rebuilt.

1—Insley "K-12" ½ yd. Trench Hoe, rebuilt.

4—Bantam "M-49" ¾ yd. Hoes or Draglines mounted GMC 6x6's.

1—Bantam "H-47" Mounted on Chev. 4x4, Hoe or Drag, priced low.

1—PGH 225A New Shovel Attachment, complete, discounted.

1—Lorain "TL-20" Used Shovel Attachment.

All the Above Equipment is Located here in Rockford!

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- 1—1 yd. Dragline
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- 3 Self-Propelled Motor Scrapers
- 12 to 15 yd. capacity

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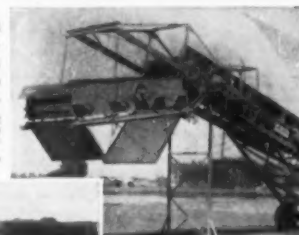
With either a double or triple-deck screen on a KOLMAN Model 101 Portable Conveyor-Screen Plant it is easy to make several sizes of material at one time. The plant has also proved ideal for scalping out oversize and rejected fines in a single operation. With the top deck removing oversize, the capacity of decks for screening fine material is increased. All this on a portable outfit.

Kolman Screens, designed to eliminate all weight, are ideal for conveyor installations. Their "floating action" avoids transmitting vibrations to the conveyor.

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COMPLETELY PORTABLE
CONVEYOR-SCREEN PLANT
CONVEYOR - SCREEN - TRAP - FEEDER



Above, 5' x 12' double-deck screen on Kolman 101.

Left, two 5'x12' single-deck Kolman screens were mounted on 60"x42" 101 conveyors to produce over 2,000 t.p.h. of minus 1 1/2" base course gravel.

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300 Pcs.	15" WF	38#	13'-19'	220 Pcs.	7"	1	15.3#	8'-13'
35 "	16" WF	58#	17'-18'	89 "	8"	1	18.4#	8'-15'
120 "	18" WF	48.5#	15'-22'	320 "	9"	1	21.8#	10'-17'
10 "	18" WF	92#	20'-21'	350 "	15"	1	42.9#	15'-21'
186 "	20" WF	60#	16'-21'	58 "	18"	1	54.7#	15'-26'
8 "	21" WF	88#	17'-21'	113 "	20"	1	65.4#	15'-25'
10 "	22" WF	65.5#	20'	6 "	20"	1	100#	33'8"
233 "	24" WF	73#	19'-20'	20 "	24"	1	79.9#	17'-24'
53 "	24" WF	76#	20'-21'	300 "	7"	to	15" U	8'-21'
				90 Pcs.	8 x 8 H	31.8#	81#	10'-28'
				75 "	10 x 10 H	49#	88#	10'-29'
				20 "	12 x 12 H	65.5#	91.5#	10'-30'
				70 "	14 x 14 H	120#	287#	15'-31'6"
				400 Tons Misc.	WF & I Beams	Not Listed		

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1/4	.622	.782	140	25	77	100-400	7	\$ 6.00
1/2	.622	.840	300	Full	135	100-400	10	8.00
3/4	.824	1.024	125	20	77	100-400	12	10.00
1	.824	1.050	175	Full	120	100-400	14	11.50
1-1/4	1.070	1.380	140	Full	90	100-300	18	13.00
1-1/2	1.380	1.600	115	Full	80	100-300	27	18.00
2	1.610	1.900	115	Full	68	100-250	32	25.00
	2.07	2.378	105	25	58	100-200	44	32.00

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Adapters	\$.22	\$.24	\$.32	\$.34	\$.42	\$.48
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3 1/2 yd. P&H Shovel
1 1/2 yd. Marion Shovel
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Insley	Model K dragline, swamp tracks	\$1,850.00
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Chicago	Model LS-51 dragline	\$1,500.00
Mighty Midget	Pneumatic 105' air compressors 3 available each at Rapid Pavement Breaker	\$2,000.00
Rex	6s 1-bag concrete mixer	\$1,250.00
Kwik Mix	16s 3-bag concrete mixers with batchmaker & pump 3, each	\$3,000.00
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2B7109	Valve Lifter Guide	1.00 ea.
1F6903	Shaft Assembly	7.50 ea.
5F8313	Manifold	7.50 ea.
1B9399	Bearing	7.50 ea.
5F1248	Bearing	7.50 ea.
5F1253	Shaft Assembly	30.00 ea.

Allis-Chalmers

214337	Radiator (Power Unit or C & CA Farm Tractor)	22.50 ea.
70206	Brake Drum	35.00 ea.
050444	Bearing Cup	3.00 ea.
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P & H

5T1717	Bearing (Brass)	\$30.00 ea.
5T782	Bearing (Brass)	25.00 ea.
5T1540	Bearing (Brass)	17.50 ea.
5T1639	Bearing (Brass)	.....	7.50 ea.
5T1573	Bearing (Brass)	.....	37.50 ea.
5T1188	Brass Bushing	.....	1.75 ea.
2P178C1	Lots of 25	.....	50.00 ea.
19T2111C1	Gear	7.50 ea.
20T3786C1	Planetary Pinion Pin	12.50 ea.
18P40F1	Connector Rod	15.00 ea.
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915T12	Brake Wheel Assembly	2.75 ea.
915T16	Cylinder Assembly	6.50 ea.
915N124	Compensator Assembly	7.50 ea.
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69A254	Bearing (Brass)	\$ 4.50 ea.
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- 1—Nearly New Cedarapids 3 x 8 D.D. Horizontal Vibrating Screen
(Missoula) **\$2250.00**
- 1—Pioneer 4 x 12 - 3 1/2 Deck Vibrating Screen
(Missoula) **\$2100.00**
- 1—UD-18A International Diesel Power Unit
(Great Falls) **\$1950.00**
- 1—Pioneer Bituminous Paver, 1956 model
(Billings) **\$7000.00**
- 1—Cedarapids Straight Line Tandem Crushing Plant, 10 x 24 Jaw, 30 x 18 Rolls with feed, delivery conveyors, feeder, bin, power plant
(Great Falls) **\$27,500.00**
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(Great Falls) **\$2750.00**
- 1—Caterpillar D-6 hydraulic loader with 2 yard bucket
(Billings) **\$9500.00**

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3,000# DROP HAMMER
with 778# Follower Block & 20' Hanging Lead
PRICE—\$995.00

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With The Manufacturers

ORANGEBURG MANUFACTURING CO., a division of The Flintkote Company reports the appointment of Harry N. Dietz as vice president, it was announced by H. J. Robertson, Orangeburg president. Dietz, who will make his headquarters in Orangeburg's New York City offices, will continue in charge on conduit sales and will additionally be assigned to various administrative duties.

ARMCO DRAINAGE & METAL PRODUCTS, Inc., will begin construction of their manufacturing plant soon at Wallkill, N. Y., it was announced today by M. C. Patton, chairman of the company. Armco Drainage is a subsidiary of Armco Steel Corporation. It operates a network of 54 manufacturing plants in the U. S. and Canada, and is one of the continent's largest producers of steel products for agriculture and the construction industry.

AMERICAN-MARIETTA COMPANY has announced the acquisition of Concrete Materials & Construction Company of Cedar Rapids, Iowa. The purchase includes an associated firm, Concrete Materials Company. With 700 persons employed, production of crushed stone, sand and gravel by the two companies exceeded 6 million tons in 1958.

BUFFALO-SPRINGFIELD DROPS "ROLLER" FROM COMPANY NAME: The change in the name of the "Buffalo-Springfield Roller Company" to "Buffalo-Springfield Company" was recently announced by Peter P. Graser, Secretary-Treasurer of Koehring Company, the parent corporation. Buffalo-Springfield, a division of Koehring, has been a pioneer and leading manufacturer of road rollers and compaction equipment for almost 70 years. The name change is a result of the recent shift of the manufacturer of Stardrill-Keystone drilling rigs and equipment from Beaver Falls, Pennsylvania to the Springfield, Ohio plant.

FOR SALE

'40-D6 CATERPILLAR
with cable dozer
completely reconditioned \$3495.00
'55 OLIVER O-63
with dozer \$1495.00
'54 OLIVER O-C6 DIESEL
with dozer \$2395.00
'51 FWD Model H A Y
chassis & cab
16,000 actual miles \$1595.00

SNOW PLOWS
X F86 Wausau V Plows
X 250 Wausau V Plow w/wings
Willett Underbody blade, like new

ROFFERS CHEVROLET SALES
Ashland, Wisconsin Dial Mu 2-3456

ALLIS-CHALMERS MANUFACTURING COMPANY appointments announced in August include the following:

V. M. Holloway to the newly created position of General Sales Manager, Construction Machinery Division, Milwaukee.

A. E. Dorn, who has been Sales Manager for the Division, takes over the newly created post of Manager of Sales Training, headquartered at the company's Springfield Works.

J. M. Haile, who has been Assistant Sales Manager of the Construction Machinery Division, is appointed Assistant General Sales Manager, a newly created position.

K. A. New is appointed Manager of Dealer Development, a newly created position. Since 1957 he has been Sales Manager, Eastern Region.

L. D. Myers succeeds New as Eastern Region Sales Manager after serving as Construction Machinery Branch Manager at Memphis.

L. D. Craggs, since 1957 Construction Machinery Sales Manager at Memphis, succeeds Myers at Branch Manager there.

JAMES R. MILLER, chief engineer of lift trucks for Clark Equipment Co., Battle Creek, Mich., has been appointed director of engineering of Minneapolis-Moline Co., J. Russell Duncan, president, announced recently.

J. L. CUMMING has been named manager of the eastern sales division of The Firestone Tire & Rubber Company with headquarters in New York, according to E. B. Hathaway, vice president in charge of all sales.

CUMMINS ENGINE COMPANY, Inc. has announced the appointment of five men to new positions as divisional sales managers. The appointees and their headquarters are: R. F. Davis, mid-west division, Chicago; G. W. Paine, Canadian, Toronto; G. A. Daum, western, San Francisco; F. J. Loeloff, eastern, New York; and R. R. MacDonald, southern, Atlanta.

ROBERT L. KOOB has joined the Allis-Chalmers Manufacturing Company as director of public affairs, a newly created position. He will act as a consultant on government affairs to all divisions of the company. His activities will emphasize the role of citizenship in local, state and national affairs.

GENERAL ELECTRIC'S BALLAST DEPARTMENT, DANVILLE, ILL., will have Ralph A. Huwe as manager of Technical and Engineering Administration, engineering manager G. C. Harvey announced recently.



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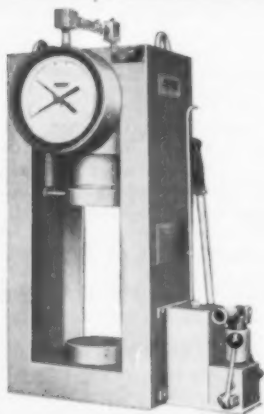
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BRICK AND DRAIN TILE
FORNEY'S INC.
TESTER DIVISION
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... for more details circle 304
on enclosed return postal card

DIAMOND T MOTOR TRUCK COMPANY announces the appointment of seven new dealers, all of whom are now actively merchandising the manufacturer's line of heavy-duty trucks. They are: Max W. Smith, Balliettsville, Pa. Rocky Mount Trading Company, Inc., Rocky Mount, N. C., Empire Equipment Sales, Kalispell, Mont., Dean Powers Company of Rockford, Rockford, Ill. Truck and Trailer Sales Corporation, Savannah, Ga.; The Service Center, Mobile, Ala. Merle Kelly Equipment Co., Kansas City, Mo.

WORTHINGTON CORPORATION announced the appointment of Baker Equipment Engineering Co., Inc., Charleston, W. V. to handle the distribution of construction equipment in West Virginia. The company's franchise includes portable compressors, contractor's pumps, air tools, mobile drills, portable mixers, truck mixers, big mixers, pavers and aggregate reclaimers units.

THE MILITARY'S JOINT CHIEFS OF STAFF has selected Robert G. LeTourneau to receive the 1959 National Defense Transportation Association's Award, according to Secretary of Defense Neil McElroy. The award, scheduled for presentation October 14, identifies LeTourneau as the person "whose achievement contributed most to the effectiveness of the transportation industry in support of national security."

Chief among the LeTourneau firm's contributions has been the development of an "electric wheel" system for powering ultra-heavy duty equipment. During World War II the company supplied an estimated 70 percent of all basic earthmoving equipment used by the armed forces throughout the world.



R. G. LeTourneau

WRIGHT-THOMAS EQUIPMENT CO., Charleston, W. Va. has been appointed crane-excavator distributor by Bucyrus-

Erie Co., South Milwaukee, Wis. The dealer's territory covers all but a small portion of West Virginia.

FEENAUGHTY MACHINERY COMPANY, Portland, Ore. has been appointed distributor for Oregon and southern Washington for the Parsons Company, Newton, Iowa. Parsons is a division of Kochring Company.

LESTER J. LARSON, manager of the American Bridge Division plant in Gary, Ind., has been appointed manager of operations for this division of U. S. Steel, it was announced today by R. B. Hunter, vice president, operations, for American Bridge.

AMERICAN HOIST & DERRICK CO. has elected two new members to the Board of Directors according to an announcement made by John E. Carroll, president. They are Porter Thompson, a partner in the Law Firm of Lennell, Brown, Perkins, Thompson & Hinckley or Portland, Maine, and Donald R. Berner, President of Hetherington & Berner of Indianapolis, Ind. Hetherington & Berner, Inc., is the new wholly owned subsidiary of American Hoist.

GREENVILLE STEEL CAR COMPANY has announced that it will now market rippers, scrapers, loaders and other related products under the trade name of "Greenville." The "Ateco" trade name will be discontinued.

FLEX-O-LITE Manufacturing Corporation reports that two new plants, in St. Thomas, Ontario, Canada, and Paris, Texas, will soon be in operation. The Ontario plant will produce reflective glass beads for highway and industrial uses, while the Texas factory will confine its output to beads for industrial purposes.

THE APPOINTMENT OF JOHN M. BALS as general manager of Aurora Pump Division was announced by C. T. Zanol, president of The New York Air Brake Company. Bals succeeds Frank S. Main, who, due to health reasons relinquished his responsibilities as general manager.

EDWARDS G. "NED" STANHOPE, a veteran of 14 years in New England business and industry, has been named Yale Hoisting Equipment district manager for that area by Fred E. Rau, Hoisting Equipment sales manager, Yale Materials Handling Division, The Yale & Towne Manufacturing Co. The new district manager will supervise sales and service activities of Yale's network of industrial distributors in Maine, Vermont, New Hampshire, Massachusetts, Rhode Island and parts of Connecticut.

NEW POLICY ENVIRONMENT

Continued from page 111
local transportation facilities."

The crying need, he declared, is for development of local transportation plans "by local authority . . . These plans can be made only to the extent that state authority allows them. When they are made they require the expenditure of federal funds. The three levels of government, therefore, must keep their eyes on the same planning objectives, if the money of all three is to bring about the best available transportation for local, regional, and national needs. As the highway program progresses the three levels must concentrate their efforts on specific plans in which each has had a part."

Mr. Allen indicated that the federal government would play a more active role in encouraging local planning as a step to be taken before location of Interstate routes and that this is a major subject of study by the Administration.

In the meantime, highway transportation continues to grow. It has become the dominant form of trans-

portation, and as such requires, as noted above, the continuous attention of top federal officials.

"In 1954," he pointed out, "the President did take time to do these things (study highway needs and develop plans for the future). The result was the greatest highway program in history. In 1959 we again have taken the time to surmount the difficulties of continuing the program on an adequate base."

"We will solve these management problems. We will solve them and retain a balanced highway budget. While we solve our problems, the states and highway users will have the assurance that the program will continue on a large scale. In particular the states can be assured the resources for planning soundly for the coming construction year."

A SERIES OF COURSES covering preventive maintenance, trouble-shooting, and repair of major components used on Euclid earthmoving equipment is being offered by Euclid's service training department. The school will be held at the General Motors Training Center, 1444 First Avenue, San Leandro, Calif. from November 16 through December 18 and will be open to all Euclid owners, operators, and service personnel from the San Francisco area.

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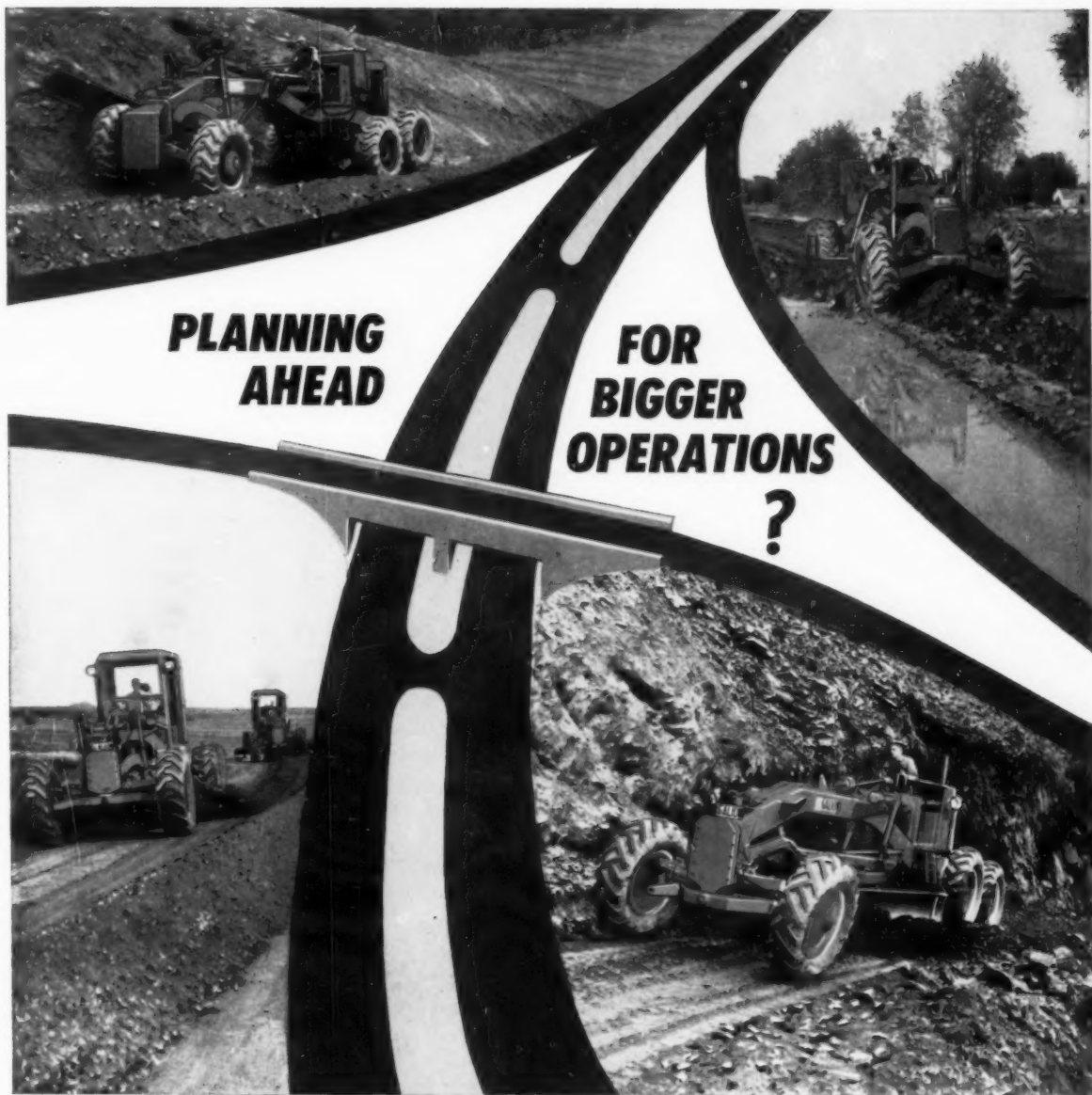
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When Illinois modernized the worn, narrow concrete pavement on 17 miles of U. S. Route 36, the project had one unusual feature—the thickness of the new plant-mixed Texaco Asphaltic Concrete pavement.

Last year, after the old pavement had been undersealed with asphalt, it was covered by two courses of Texaco Asphaltic Concrete, a 1-inch leveling course and a 2-inch surface.

In 1959, when the pavement was widened, two more layers of Texaco Asphaltic Concrete were added, each 1½-inches thick. As a result, this section of U.S.-36 now has a heavy-duty 6-inch asphalt pavement capable of withstanding the weight and impact of modern truck traffic year after year with a minimum of upkeep.

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